



Improving multiplication counting skills of class IV students using PBL model and Jarimatica technique

Amelia Citra *

* Elementary School Teacher Education, Faculty of Teacher Training and Education, Tadulako University

amelyacitraa31@gmail.com

Sisriawan Laapasere **

** Elementary School Teacher Education, Faculty of Teacher Training and Education, Tadulako University

sisriawan23@untad.ac.id

Asriani ***

*** Elementary School Teacher Education, Faculty of Teacher Training and Education, Tadulako University

anijasmine2107@gmail.com

Pahriadi ****

**** Elementary School Teacher Education, Faculty of Teacher Training and Education, Tadulako University

fahriadi.amir@gmail.com

Surahman *****

***** Elementary School Teacher Education, Faculty of Teacher Training and Education, Tadulako University

surahmanmilade@untad.ac.id

Submitted: 2024-07-13

Revised: 2024-07-15

Accepted: 2024-09-28

ABSTRACT

This research is quantitative in nature using a non-equivalent control group design. The sample consisted of class IVA as the controlling classes and the IVB as the experiment classes. The instrument used is an essay test that has been validated both validity and reliability. The analysis data was carried out with prerequisite test including tests for normality and homogeneity, as well as testing of hypotheses using the paired sample t-test, with help the IBM SPSS Statistics 25. The results show that a significance the value (2-tailed) of 0.000 less than the alpha value of 0.05. Since 0.000 less than 0.05, the alternative hypothesis (H_a) is accept and the null hypothesis (H_o) is reject. Therefore, conclusion is that the problem-based learning model and the finger math technique significantly improve the counting multiplication skills of SD Inpres 7 Labuan Baru fourth graders.

Keywords: Problem Based Learning Model; Jarimatica Technique; Multiplication Counting Ability

ABSTRAK

Penelitian ini bersifat kuantitatif dengan menggunakan jenis desain Non-equivalent control group design. Sampelnya terdiri dari kelas IVA sebagai kelas kontrol dan IVB sebagai kelas eksperimen. Instrumen yang digunakan adalah soal essay yang telah divalidasi baik validitas maupun reliabilitasnya. Analisis data dilakukan dengan uji prasyarat meliputi uji normalitas dan homogenitas, serta pengujian hipotesis menggunakan uji berpasangan sampel t-test, dengan bantuan IBM SPSS Statistics 25. Hasil penelitian menunjukkan bahwa nilai signifikansi (2-tailed) sebesar 0,000 lebih kecil

dari nilai alpha sebesar 0,05. Karena 0,000 kurang dari 0,05 maka hipotesis alternatif (H_a) diterima dan hipotesis nol (H_0) ditolak. Oleh karena itu, dapat disimpulkan bahwa model pembelajaran berbasis masalah dan teknik finger math secara signifikan meningkatkan keterampilan berhitung perkalian siswa kelas IV SD Inpres 7 Labuan Baru.

Kata Kunci : Model Pembelajaran Berbasis Masalah; Teknik Jarimatika ; Kemampuan Menghitung Perkalian

INTRODUCTION

Mathematics is one of from a number of eye necessary lessons mastered in the world of education (Yulia R et al., 2024:2304). Learning mathematics is very important in developing human qualities, so it is important For studied starting from elementary school (Acharya, 2017:8; Maryanto, et al., 2023:65; Rahmayanti, 2023:2). Not only That Mathematics is also important Because is knowledge basis that provides many contributions for life man (Hodaňová & Nocar, 2016:3092; Yantoro et al., 2020:190). Remember importance learning mathematics in various aspect life, therefore That mathematics No can separated from learning (Siswondo & Agustina, 2021:34; Muslimin, 2024:2689). One of objective learning mathematics is for students can do operation counting (Syamsuddin et al., 2018:72; Yuyuk E, 2019:4-5). For control operation counting, students must moreover formerly own ability counting. Studying mathematics helps people become more creative and accustomed to methodical, scientific, logical, and critical thinking (Suryani et al., 2024).

According to Rizki et al., (2023:913) numeracy is a skill in performing arithmetic operations such as addition, subtraction, multiplication, and division. Counting is something important skills in life every day, so can said that every activity important in life man need ability (nyimas Aisha in Sari, et al., 2021:227; Himmah, et al., 2021:59). From these several opinions, we can know that counting skills in children are very important both at school and in everyday life, this is because almost everything in this world involves calculation operations. For example, if a child wants to buy snacks, to pay for them, students need the ability of counting operations. Not only that, the ability to count is also very influential on learners learning outcomes at school because with the ability to count students can answer assignments, or daily exam questions both on multiplication, addition, division, and subtraction material given by teachers at school. However, in learning mathematics, especially in arithmetic multiplication operations, it is not uncommon to find students experiencing difficulties and not interested in calculations.

Based on the findings from interviews conducted by researchers on October 17, 2023 with mathematics learning subject teachers, said that the students' numeracy skills were still low, especially in counting multiplication. This can be noted from the number of students who not yet able to answer multiplication questions in maths learning materials worth fractions. In accordance with the information given by the math learning teacher that when given a daily exam question about multiplying fractions out of 15 students only 6 people can answer the question correctly with a percentage of 40%, while students who have not been able to answer the question correctly are 9 people with a percentage of 60%. In addition to conducting interviews with teachers, researchers also conducted interviews with fourth grade students, from the results of student interviews said maths that learning subjects are difficult subjects, especially multiplication material, most students also still cannot do multiplication

calculations. This is because the learning techniques and models that teachers apply in learning are only conventional using more lecture methods and memorization to be able to do calculations.

Hidayati in (Mulyawati et al., 2020:228) also suggested that one of the factors which affect children low numeracy skills is external factors. External factors are factors from outside the learners that can affect the ability to count, for example, learning that is less fun, a monotonous learning process, and learning media that is less interesting so that it makes children feel bored and less excited Nataliya in (Sahrunayanti et al., 2023:435; Rahayu et al., 2022:43).

From the earlier explanation, it is evident that students' proficiency in numeracy remains low due to various factors. This low numeracy ability indicates the need for a solution to the problem. One of the steps that can be taken for this problem is to improve learning activities by choosing effective learning models and techniques.

Based on the findings of previous research carried out by Hayati, et al., (2023) It has been proven that a use of the problem-based learning model enhance students' multiplication as well division counting skills. Problem-based learning is a student -centered learning model that aims to develop problem-solving skills through independent learning as a lifelong habit and teamwork skills (Ali S.S, 2019:73). Learning model based problem is a learning model in which the learning process begins by presenting real world or contextual problems which aims to develop students' higher thinking patterns, think critically and be able to solve the problems presented (Mulyanto et al., 2018:37; Siagian, et al., 2019:333). There are several benefits to the problem-based learning model, among others in this study model students will be encouraged to develop their problem solving skills in authentic situations; they can have the capability to construct their own knowledge through learning activities; learning centers around problems to ensure that material nothing to do no need to be learned by the learners; reduce students do not need to memorise or simply retain information; scientific activities occur through group work; Students' individual learning challenges can be overcome through collaboration in groups (Silvi et al., 2020:3361). In this case, It is expected that students are able to apply their numeracy ability to find solutions to the challenges they face both at school and in everyday life. The Merdeka Curriculum emphasizes active learning, student-centered, and relevant to real life. PBL is very much in line with these principles because it allows teachers to adapt learning to students' needs and interests, students are given the freedom to explore their ideas and find their own solutions, the problems presented in PBL are relevant to the context of students' lives.

Apart from that, businesses can done in increase ability counting participant educate is with use technique Jarimatika (Idzna & Haraha, 2022:199; Raupu, et al., 2023:2379). Jarimatika is a simple way to count with the help of fingers (Triwahyuningtyas & Prastiti, 2021). In addition, there are also other studies that have been conducted by Nurrohmah & Muryaningsih, (2022) said that the jarimatika technique is a technique that can improve students' multiplication and division counting skills. Jarimatika is a technique or way of counting math that uses counting aids in the form of right and left hand fingers and is practical, effective, and fast, and accurate for calculating arithmetic operations such as multiplication (Nasution & Surya, 2015). Jarimatika is something technique or method counting mathematics that uses tool help count form finger hand Right and left as well as practical , effective , fast and accurate For count operation count like multiplication (Rasmitadila & Rachmadtullah R,

2019:2; Afriani et al., 2019:193; Nasution & Surya, 2015:50). Jarimatica also teaches basic counting to children starting with providing an understanding of number concepts, number symbols, and basic counting operations and then teaching how to count using the jarimatica technique (fingers as a tool) and with fun learning, then students' math comprehension skills will increase (Hardianti et al., 2021:148). Jarimatica has features including; "1) providing visualization of the counting process, this will make it easy for children to do. 2) Excites the child when it will be used, 3) Does not burden the brain memory" (Nalole M & Sunati R, 2021:280; Aprilia, et al., 2023:197)

On that basis, researchers want to do experiments research on "whether that use Problem Based Learning models using the jarimatica technique on the ability to numeracy multiplying of fourth class students of SD Inpres 7 Labuan Baru".

METHODS

Type and Design

In this study, a kind of research used is quantitative research. Sugiyono, (2022:8) defines quantity studies as research grounded in the positivistic philosophy, which is used for research on specific populations or samples, data collection by means of research instruments, data analysis is quantitative/statistical using the goal of the test is predetermined hypothesis.

The design used in this study is Quasi experiment design that uses a controlling group and an experimental group. Types of quasi-experimental designs used was a *Non-equivalent control design*. This is similar in design to the pre-test and post-test control group design, except that experimental and control groups are not randomly selected (Sugiyono, 2022:79). Before the treatment, both groups of subjects were given a pretest as the initial test and a posttest as the final test after the treatment, with the following design.

Table 1. Proposed research design (Sugiyono, 2022b)

Class	<i>Pre-test</i>	<i>Treatment</i>	<i>Post-test</i>
Experiment	O ₁	X ₁	O ₂
Control	O ₃	X ₂	O ₄

Explanation:

O₁: *Pretest* (Before receiving treatment in the experimental class)

O₂: *Posttest* (After receiving treatment in the experimental class)

X₁: Application of PBL Learning Model and *Jarimatika Technique* in learning in class of the experimental.

O₃: *Pre-test* (Control class before treatment)

O₄: *Post-test* (After Treatment in control class)

X : Application of PBL Learning Model in control class learning

The study was carried out the SD Inpres 7 Labuan Baru which is located at Jl. Nelayan, No.38, Kec. Palu Utara, Palu City, Central Sulawesi, in the even semester of March in the 2023/2024 Academic Year. This location has been chosen because there was a problem found in the form of low student numeracy skills in fraction multiplication material so that it became a motivation for the author to carry out the research using the Problem Based Learning model and jarimatica technique.

In this study, the population is all students of SD Inpres 7 Labuan Baru, which amounted to 156 people. Class I has an equal number of male and female students, 14 each. The total number of students in this class is 28 people. Class II has more male students than female students. There are 18 male students and 12 female students, so the total number of students in class II is 30 people. Class III also has the same number of male and female students, namely 7 people for each gender. The total number of students in this class is 14 people. Class IV is divided into two, namely IVA and IVB. Class IVA has 5 male students and 9 female students, while class IVB has 7 male students and 9 female students. So, the total students in class IV are 14 students for class IVA and 16 students for class IVB. Class V has a slightly larger number of male students, namely 17 people, while there are 11 female students. The total number of students in class V is 28 people. Class VI has slightly more female students than male students. There are 11 male students and 15 female students, so the total number of students in class VI is 26 people.

This study's sample were are fourth-grade students at SD Inpres 7 Labuan Baru, with a number of 30 students made up of class IVA and IVB, Where one for experiment group and other class as control group. The experimen group in this study was class IV B which a total of 16 people, made up of 9 females and 7 males. Meanwhile, the control group in this study was class IV A which amounted to 14 people consisting of 5 females and 9 males.

Table 2. List of control and experimental class students

No.	Class	Number of Students
1	Experiment	16
2	Control	14
	Total	30

In this research, purposive sampling technique was use for sampling. Purposive sampling is the method sampling that is carried out based on special considerations or specific objectives (Sugiyono, 2022:85). The criteria that the researcher considered in choosing the sample were fourth grade students who had low multiplication counting skills.

This research activity took place starting from the implementation of research on April 01, 2024. The steps taken in this study among them are the initial stages carried out include testing the research instrument which was carried out on March 27, 2024, after testing the instrument, then managing the data from the research instrument test results and testing its validity and reliability. The second stage was to conduct the pretest to both the experimental clases and the controlling clases. This third stage, provision treatment by giving teaching for both the experiment and the controlling clases. Fourth stage, students were given a post-test in both experiment and controlling classes. That last stage is data analysis.

Data and Data Sources

Data type utilized in the research quantitative data refers to, which is derived from what students achieve in their learning solving fraction multiplication material questions and evaluation results on students. In this research, the source data will be is used primary data, which is direct source that provides information to those who collect it (Indrawan R &

Yaniawati P, 2014:141). The data sources of this study are educator and students of SD Inpres 7 Labuan Baru. The reason for taking primary data sources is to collect information about the improvement of students' numeracy skills taken from outcomes of student learning after implementing the Problem Based Learning model and jarimatica technique using tests to student.

Data collection technique

There are two data collection techniques used in this study include is namely testing and non-testing techniques. The test techniques is applied for assess students numeracy abilities in multiplying the material to determine fractions worth, with indicators of numeracy skills according to Sukardi in (Yantoro et al., 2020:192), namely 1) able to solve multiplication problems worth fractions deftly; 2) able to create and solve problems independently, in this case it is expected that students can know the shape of fractions through pictures and make fractions worth; 3) explain how to solve the problem. Non-test techniques in this study are documentation of student work when given treatment, and how the learning process when given treatment. This documentation was used to collect information about the results of the pre-test and the post-test also process to learn activities use of problem-based learning model with jarimatica technique.

Data analysis

In this study, the following techniques for analyzing the data were descriptive statistical analysis and inferential statistical analysis will be used. The descriptive statistical analysis is utilized for data analysis by describing or explaining the data collected as it is, without having to make generalisations that are in effect for the public (Sugiyono, 2022:147). Descriptive analysis in this study was used to describe the average (mean), minimum number, maximum number and standard deviation. Inferential statistical analysis is a statistical technique used in analysing data from samples, with the outcomes then applied to the population (Sugiyono, 2022:148). The analytical technique used to test a hypothesis is the t-test was carried out with help from IBM SPSS statistics version 25. Before performing the t-test, preliminary tests were first conducted, including the assessment of normality and homogeneity, this was done to fulfillment the research requirements.

RESULTS AND DISCUSSION

This research utilized two classes as samples, class IVB is used the experiment classes and class IVA is used the controlling classes. Researchers gave treatment to both classes in one meeting. In this research, the data collection process was done through the treatment of research subjects, In this case class IVB student are treatment is provided in the form of a applying learn models and techniques, namely through discussion and understanding the



problems to be solved and learning counting techniques to solve problems in the form of multiplication of fractions that have been given. Thus, the respondent receives the influence of the response given by the object of research.

Image 1. Learn process using Jarimatica Technique and PBL Learning Model

When providing treatment to the experiment group, researchers used the problem-based learning model and the jarimatica technique. It was seen that when this learning model was applied, students were easier to understand and solve a problem that was being studied, because this learning model was applied in groups and discussed to solve a problem related to fractions worth. The use of the jarimatica technique is also very helpful for students in solving problems related to the multiplication of fractions, it can be seen at the time of application of this jarimatica technique students are greatly helped to answer multiplication problems in determining fractions worth.



Image 2. Learning process using PBL Learning Model

When treated the control classes using problem-based learning model, it was seen student were very actives on discussing in groups to solve problems about a multiplication of fractions. However, because most students had not mastered multiplication well, this led to many errors in answering questions about the results of multiplying fractions.

Pre-test Post-test Data Analysis Results

The pre-test is an initial test for the determination of the initial capability of students in counting multiplication tables. This initial test was conducted in the experimental group of 16 student, and the controlling group of 14 students. Pretest data analysis results of the experiment class and the controlling class are shown in the table below.

Table 3. Results of pre-test analysis

		Descriptive Statistics			
N		Minimum	Maximum	Mean	Std. Deviation
Experiment PreTest	16	42	66	53.00	6.822
Control PreTest	14	42	61	49.79	6.278

It is based on the table above, It is clear to see that the average value from students of the experimental class It is 53.00, while the mean value of the control class is 49.79. Initial test (pre-test) results of the experimental test group achieved a minimum value is obtained of 42 and maximum value of 66, while the control group retrieved an minimum value is 42 and maximum value of 61.

The post-test is the final test conducted to measure students' abilities after being given the treatment. Data obtained from the post-test examination the experimental classes and control classes are visible in the following table.

Table 4. Analysis results of the post-test
Descriptive Statistics

N		Minimum	Maximum	Mean	Std. Deviation
Experiment PostTest	16	85	100	93.13	4.787
Control PostTest	14	61	85	74.93	8.081

From the previous table, it can be that the average number of (mean) the scores of students at experiment group who utilized the problem-based learning model of learning and jarimatica technique is 93.13, with a range of values ranging from has a value minimum of 85 to a value maximum of 100. Meanwhile, group of students in the controlling class, that's only used the problem-based learning model of the an average (mean) scoring of 74.93 with a minimum scoring range of 61 to a maximum of amount of 85.

Achievement Results of Numeracy Ability Indicators

The results of the average percentage of achievement of indicators of multiplication counting ability calculated based on the post-test results from the students in experimental and control classes after they receiving treatment, are presented in the table below.

Table 5. The percentages of achievement of the indicators of the ability to count multiplication

No.	Indicator	Experiment Class (%)	Class Control (%)
1	Solve multiplication problems in determining equivalent fractions.	95,83	84,12
2	Creation and solution of a multiplication problem to find equivalent fractions	90,62	59,52
3	To explain how to solve multiplication problems with fractions that are equivalent.	93,75	77,38
	Totaling	93,4	73,67

From the data in the table above, there is a difference between the experimental class and the control class in the average percentage of achievement of each indicator of students' numeracy skills. In overall mean score from three numeracy skill indicators in the experimental class is 93.4%. whereas overall the mean value three indicators of numeracy ability in the control class is 73.67.

The experimental group ability numeracy indicators have a high level of achievement in all aspects of the indicator, the highest percentage of performance in the experimental class in the aspect of solving multiplication problems in determining fractions worth with a percentage of 95.83 and the indicator with the lowest percentage of achievement is making and solving multiplication problems in determining fractions worth with a percentage of 90.62. While the indicator of multiplication counting ability that has the highest presentation in the control class is on the aspect of solving multiplication problems in determining fractions worth with a percentage of 84.12, and the indicator that has the lowest percentage of achievement is on the aspect of making and solving multiplication problems in determining fractions worth with a percentage of 59.52.

Prerequisite Test Results

In this study, the prerequisite test consists of several tests such as the normality tests, the homogeneity test, and hypotheses testing. The normality testing has carried out to ensure that the data collection has a normal distribution or no. Testing for normality was conducted based on the outcomes from both the pretest and post-test after treatment.

The criteria used to assess normality is when the significance value > 0.05 , which shows that the data has a normality distributions, whereas If a obtained significance value < 0.05 , the data are not significant (Herlina, 2019:83). The normality test results for control and experimental classes is shown in the following table.

Table 6. Data from Pre-test and Post-test Normality Test Results

		Test for normality		
		Shapiro-Wilk		
	Classes	Statistic	df	Sig.
Results	Experiment PreTest	.927	16	.218
	Experiment PosTest	.894	16	.065
	Control PreTest	.896	14	.099
	Control PostTest	.904	14	.128

According to the provided data presented in the above table, can be seen the results of the normality test using Shapiro-Wilk with the help of IBM SPSS statistics version 25 displays that all data is have a Significance value > 0.05 . The Shapiro-Wilk test is a Sig value of the 0.218 for experimental pre-test and 0.099 for control class pre-test, both of which were greater than 0.05. Similarly, the Sig score for the experimental Post-test was 0.065, and for the control group post-test was 0.128, both of which were also greater than 0.05. Therefore it can conclude that all data are normally distributed, so it can proceed with data analysis.

Homogeneity tests involve the statistical procedures uses designe for determine whether of two or more data samples that from the population that a same distribution (Sianturi, 2022:388). The criteria used in a study to determine population homogeneity when the obtained Sig value $\geq$ the indicated α value of 5% (0.05), then this indicates that the data groups are derived from populations with equal variance (homogeneous) (Gunawan C, 2020:68). The results of the homogeneity test for the experiment and controlled groups are shown in the table below.

Table 7. Homogeneity of the experiment classes and the control class

		Test for Homogeneity of Variance			
		Levene Statistic	df1	df2	Sig.
Results	Based on Mean	1.828	3	56	.153
	Based on Median	1.457	3	56	.236
	Based on Median and with adjusted df	1.457	3	54.416	.236
	Based on trimmed mean	1.820	3	56	.154

From the table above, we can find out significance the experimental value and control classes of 0.153 is greater than the specified α level ($0.153 > 0.05$), therefore, can be conclude that the experimental and control group data equally is homogeneous.

The test of hypotheses is carried out to test the truth of a statistical requirement and conclude whether the requirement is accepted or rejected. Testing of hypotheses is performed

at 5% (0.05) level of significance. In decision-making criteria for accepting or rejecting H_0 in this test are if the value of significance is > 0.05 , then H_a reject and H_0 accepted, while if the significance value < 0.05 then H_a accept and H_0 reject. In table below display the outcomes to test for homogeneity conducted on the experimental and controlling groups.

Table 8. Paired T Test Results

		Test paired samples							
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Experiment PreTest - Experiment PostTest	-40.125	5.175	1.294	-42.883	-37.367	-31.013	15	.000

On the basis of the above table, the significance Since t-test the value is less than 0.05 (0.000 < 0.05), H_a accept and H_0 rejection. Therefore, it can be concluded that there is an influence of exists in use of problem-based learning model using jarimatika technique to improve in multiplication counting ability students from SD Inpres 7 Labuan Baru.

From the results of analyzing the data, it is evident that employing problem-based learning models and the technique jarimatika significantly impacts students' multiplication counting skills. The results of this research are supported by the results of previous study conducted by Hayati et al., (2023) in their research explained that the problem-based learning model can an improvement student ability a multiplication counting. This problem-based learning model encourages students to be able to actively participate in conducting discussions in class and learn from the problems given to find solutions. This is accordance with the opinion from the Masliah et al., (2023:2) that the Problem-Based Learning model encourages students to focus on solving authentic problems in learning with the aim that students can solve. This study is also supported by research from Nurrohmah & Muryaningsih, (2022) who obtained research results that the jarimatika technique was proven to improve students' multiplication and division counting skills. This is because the jarimatika technique is an easy and fun math counting technique using fingers to help students in operating arithmetic (Fausia et al., 2021:369). Using the jarimatika technique can help students who are still less able to count multiplication. This is in accordance with the advantages of using the jarimatika technique according to Aryani, (2020:4) Among them are 1) Jarimatika provides a visualization of the counting process that makes it easy for children (students) to do it, 2) Jarimatika relatively does not burden the brain memory when used, 3) The tool does not need to be bought, always carried or forgotten where to store it, 4) The movement of the fingers will attract the child's interest.

CONCLUSION

from the results of the analysis of t-test resulted in a significant value 0.000 which indicates that the significance value of the t-test is $< \alpha$ ($0.000 < 0.05$). Wherefore, accepting alternative hypothesis (H_a) and rejection of the null hypothesis (H_o). Thus, the conclusion that can be drawn is that there an impact of use the problem-based learning model and jarimatika technique to the multiplication counting ability of grade IV students at SD Inpres 7 Labuan Baru. The results of pre-test and the post-test show a change in the level of the students' counting ability in the experiment classes using problem-based learning models and jarimatika technique, with average pretest value of 53.00, while the minimum value was 42 and the maximum value was 66. Then it increased in the posttest score to 93.13 with a minimum value of 85 and a maximum of 100. The problem-based learning model using the jarimatika technique can enhance students' numeracy skills because it not only helps students understand and solve problems but also facilitates their calculations in solving fraction multiplication problems using the jarimatika technique. It is hoped that in the future this research can be tried by combining the PBL model and Jarimatika techniques with other learning methods, such as games or technology, to see an increase in effectiveness.

REFERENCES

- Acharya B.R. (2017). Factors Affecting Difficulties in Learning Mathematics by Mathematics Learners. *International Journal of Elementary Education*, Vol. 6, No. 2, 8–15. doi:10.11648/j.ijeeedu.20170602.11
- Afriani, D., Fardila, A., Septian, G. D., Margakaya, S., Ciranggon, J., Karawang, P. M., Sukamaju, S., Sukamaju, K., Barat, P. B., & Siliwangi, I. (2019). Penggunaan metode jarimatika dalam meningkatkan kemampuan berhitung perkalian pada siswa sekolah dasar. *Journal of Elementary Education*, 2(05), 5. <https://doi.org/10.22460/collase.v2i5.3342>
- Ali S.S. (2019). Problem Based Learning: A Student-Centered Approach. *English Language Teaching*, Vol. 12, No. 5, 73–78. <https://doi.org/10.5539/elt.v12n5p73>
- Aprilia R., Widyasar R., Sari R. F., Cipta H., Huaein I., & Rahayu S. U. (2023). Pelatihan Jarimatika Pada Masyarakat Desa Pantai Cermin Kanan. *Amaliah: Jurnal Pengabdian Kepada Masyarakat*, Volume 7, No 1, 195–200. <https://doi.org/10.32696/ajpkm.v7i1.2304>
- Aryani, R. (2020). Pengaruh Metode Jarimatika Terhadap Hasil Belajar Siswa Kelas 4 di MI Futukhiyah Pamulihan, Warungpring, Pemalang. *IBTIDA (Jurnal Kajian Pendidikan Dasar)*, 1, 2746–3834. <https://www.journal.stitpemalang.ac.id/index.php/ibtida/article/view/184>
- Fausia N., Upu H., Talib A., Natalia F., & Asfar. (2021). The Development of Jarimatika Method in Increasing the Speed of Counting Through AndroidBased Taktikjar Learning Media. *Jurnal Atlantis Press*, volume 611, 338–372. <https://doi.org/10.2991/assehr.k.211211.063>
- Gunawan C. (2020). *Mahir Menguasai SPSS, Paduan Praktis Mengolah Data Penelitian* (Edisi Pertama). CV Budi Utama.
- Hardianti T., Atiaturrehmaniah, A., & Yazid, Muh. (2021). Pengaruh Teknik Jarimatika Terhadap Hasil Belajar Matematika Materi Penjumlahan dan Perkalian 1-10. *Prima Magistra: Jurnal Ilmiah Kependidikan*, 2(1), 116–123. <https://doi.org/10.37478/jpm.v2i1.879>

- Hayati M, Nurmawati I, & Makki M. (2023). Model Problem Based Learning Dalam Meningkatkan Kemampuan Berhitung Perkalian dan Pembagian Siswa Sekolah Dasar. *Jurnal Educatio*, Vol.9, No.4, 2036–2042. <https://doi.org/10.31949/educatio.v9i4.5795>
- Herlina V. (2019). *Paduan Praktis Mengolah Data Kuisisioner Menggunakan SPSS* (Edisi Pertama). PT Elex Media Komputindo.
- Hodaňová, J., & Nocar, D. (2016). Mathematics importance in our life. *INTED2016 Proceedings*, 3086–3092. <https://doi.org/10.21125/inted.2016.0172>
- Idzna Z.F, & Harahap J.Y. (2022). Effort Increase Ability Count Beginnings Through Method Jarimatika for Children Aged 4-5 Years at RA Babuttaqwa Ward Fir Year Teachings of 2021/2022. *International Journal of Educational Research Excellence (IJERE)*, Volume 01, Number 02, 198–201. <https://doi.org/10.55299/ijere.v1i2.216>
- Indrawan R, & Yaniawati P. (2014). *Metodologi Penelitian Kuantitatif, Kualitatif, dan Campuran untuk Manajemen, Pembangunan, dan Pendidikan*. (Atif Nurul Falad, Ed.; Edisi 1). PT. Refika Aditama.
- Maryanto B. P. A, Rachmawati L. N, Muhammad I, & Sugianto S. (2023). Literature Review: Problems of Mathematics Learning in Schools. *Delta-Phi: Jurnal Pendidikan Matematika*, 1(1), 65. <https://doi.org/10.61650/dpjp.v1i1.94>
- Masliah, L., Nirmala, S. D., & Sugilar, S. (2023). Keefektifan Model Pembelajaran Problem Based Learning (PBL) terhadap Kemampuan Literasi dan Numerasi Peserta Didik di Sekolah Dasar. *Jurnal Basicedu*, 7(1), 1–10. <https://doi.org/10.31004/basicedu.v7i1.4106>
- Mulyawati, Tantowie T.A, & Fuadi D.N. (2020). Upaya Meningkatkan Kemampuan Menghitung melalui Media Konkret Koin Warna (Kancing) pada Mata Pelajaran Matematika Madrasah Ibtidaiyah. *Bestari Jurnal Studi Pendidikan Islam*, Vol. 16, No. 2, 221–240. <https://doi.org/10.36667/bestari.v16i2.407>
- Nalole M, & Sunati R. (2021). The Effect Of The Use Of The Jarimatics Method On The Result Of Learning Multipurpose Original Number in Class IV Students SDN 06 Tapa Bone Bolango. *International Journal Of Innovations In Engineering Research And Technology*, Volume 8(Issue 5), 275–285. <https://dx.doi.org/10.17605/OSF.IO/EJQKR>
- Nasution T.K, & Surya E. (2016). Penerapan Teknik Jarimatika dalam Upaya Meningkatkan Kemampuan Operasi Hitung Perkalian Bilangan. *Edumatica*, Volume 05 Nomor 02,. <https://doi.org/10.22202/jl.2016.v2i2.601>
- Nurrohmah, S., & Muryaningsih, S. (2022). Pengaruh Jarimatika Terhadap Kemampuan Berhitung Perkalian dan Pembagian Kelas IV di SD Negeri Weton-Wetan. *Renjana Pendidikan Dasar*, 2(1), 32. <https://prospek.unram.ac.id/index.php/renjana/article/view/193>
- Rahayu, S. R., Supriyanto, D. H., & Susanto, S. (2022). Pengaruh teknik jarimatika terhadap keterampilan berhitung perkalian siswa kelas iv sdn jogorogo 1 kecamatan jogorogo, kabupaten ngawi. *Jurnal Holistika*, 6(1), 41–48. <https://doi.org/10.24853/holistika.6.1.41-48>

- Rahmayanti J. D. (2023). Penggunaan Metode Jarimatika Dalam Meningkatkan Kemampuan Berhitung Perkalian Dasar. *RISDA : Jurnal Pemikiran Dan Pendidikan Islam*, Volume 7, No.1, 1–13. <https://doi.org/10.59355/risda.v7i1.97>
- Rasmitadila, & Rachmadtullah R. (2019). Using of Jarimatika counting method (JCM) to slow learner students in a mathematics lesson. *Journal of Physics: Conference Series IOP Publishing*, Vol.1175, No.1, 1–5. doi:10.1088/1742-6596/1175/1/012141
- Raupu S, Arifanti D.R, Thalhah S.Z, Taqwa, & Nursyams. (2023). Efektivitas Teknik Jarimatika Dalam Meningkatkan Keterampilan Berhitung Peserta Didik Sekolah Dasar. *Aksioma: Jurnal Program Studi Pendidikan Matematika*, Volume 12, No. 2, 2378–2385. <https://doi.org/10.24127/ajpm.v12i2.7452>
- Rizki M. D., Nugroho F. A. W., Hapsari C. R., Paramitha A. P. A., Haliza, D. M. N., & Lutfiana, N. (2023). Pengaruh Kemampuan Berhitung Terhadap Nilai Pelajaran Matematika Siswa Kelas VI SD. *PESHUM: Jurnal Pendidikan, Sosial Dan Humaniora*, Vol.2, No.5, 913–920. <https://doi.org/10.56799/peshum.v2i5.2239>
- Sahrundayanti, S., Dema, M., & Wahyuningsih, W. (2023). Pemanfaatan Media Permainan Congklak dalam Meningkatkan Kemampuan Berhitung Siswa. *Jurnal Penelitian Inovatif*, 3(2), 433–446. <https://doi.org/10.54082/jupin.182>
- Sari M.P, Hader A.E, & Sukron M. (2021). Pengaruh Penerapan Metode Jarimatika Terhadap Kemampuan Berhitung Perkalian Siswa Kelas III Di Sekolahdasar Negeri 15 Koto Baru Dharmasraya. *CONSILIUM Journal : Journal Education and Counseling*, Vol.1, No.2, 226–231. <https://doi.org/10.36841/consilium.v1i2.1200>
- Siagian M V, Saragih S, & Sinaga B. (2019). Development of Learning Materials Oriented on Problem-Based Learning Model to Improve Students' Mathematical Problem Solving Ability and Metacognition Ability. *International Electronic Journal Of Mathematic Education*, 14, 333. <https://doi.org/10.29333/iejme/5717>
- Sianturi R. (2022). Uji homogenitas sebagai syarat pengujian analisis . *Jurnal Pendidikan, Sains Sosial, Dan Agama*, Volume 8 No 1, 386–397. doi:10.53565/pssa.v8i1.507
- Silvi, F., Witarsa, R., & Ananda, R. (2020). Kajian Literatur tentang Kemampuan Pemecahan Masalah Matematika dengan Model Problem Based Learning pada Siswa Sekolah Dasar. *Jurnal Pendidikan Tambusai*, 4(3), 3360–3368. <https://doi.org/10.31004/jptam.v4i3.851>
- Siswondo, R., & Agustina, L. (2021). Penerapan strategi pembelajaran ekspositori untuk mencapai tujuan pembelajaran Matematika. *Himpunan: Jurnal Ilmiah Mahasiswa Pendidikan Matematika*, 1(1), 33–40. <https://jim.unindra.ac.id/index.php/himpunan/article/view/3155>
- Sugiyono. (2022). *Metode Penelitian Kuantitatif, Kualitatif dan R&D* (Edisi 2 Cetakan-28). Alfabeta CV .
- Sugiyono. (2022). *Metode Penelitian Kuantitatif, Kuanlitatif, dan R&D* (2 cetakan ke-29). Alvabata, cv.
- Suryani, N. A., Ruqoyyah, S., & Rohaeti, E. E. (2024). IMPLEMENTATION OF THE COOPERATIVE LEARNING MODEL TYPE MAKE A MATCH TO IMPROVE THE

MATHEMATICAL CONCEPT UNDERSTANDING ABILITY IN MULTIPLICATION MATERIAL FOR 2nd STUDENTS. *Journal Of Educational Experts (JEE)*, 7(2), 82-95.

Syamsuddin, S., Jafar, M. I., & Patta, R. (2018). Analisis kemampuan berhitung siswa kelas III SD Negeri kecamatan Ulaweng kabupaten Bone. *Jurnal Publikasi Pendidikan*, 8(1), 71-75. <http://ojs.unm.ac.id/index.php/pubpend>

Triwahyuningtyas, R., & Prastiti, T. D. (2021, May). The analysis on implementing discovery learning-based learning instruments in improving students' creative and innovative thinking skills in completing problem of simple multiplication by using jaritmatika. In *IOP Conference Series: Earth and Environmental Science* (Vol. 747, No. 1, p. 012121). IOP Publishing.

Yantoro, Hayati S., & Herawati N. (2020). Strategi Guru dalam Meningkatkan Kemampuan Berhitung Siswa Kelas V Sekolah Dasar. *ADI WIDYA: Jurnal Pendidikan Dasar*, Volume. 5, Nomor 2, 189-194. <http://ejournal.ihtn.ac.id/index.php/AW>

Yulia R, Isrok'atun, & Aeni A. N. (2024). Pengembangan KATARIAN Sebagai Media Edutainment Untuk Meningkatkan Kemampuan Berhitung Perkalian Siswa Kelas 3 Sekolah Dasar. *Jurnal Elementaria Edukasia*, Volume 7, No. 1, 2303-2319. <https://doi.org/10.31949/jee.v7i1.8263>

Yuyuk E. (2019). *Pembelajaran Matematika SD* (Haryono Ari Dwi, Ed.; Edisi 1 Cetakan Ke1). Universitas Muhammadiyah Malang.