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Article

# Development of magic indonesia jarimatic method in counting to improve learning outcomes of numbers in elementary school

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**ABSTRACK**

This research develops a counting method, namely the Indonesian magic jarimatik method, which is motivated by students' numeracy skills that are not in accordance with national standards in the AKM, limited counting methods as a source of learning numbers used in elementary schools in the teaching and learning process. This study aims to determine the effectiveness of the JMI method in learning Mathematics to improve elementary school learning outcomes. This research uses the ADDIE development research model, namely: Analysis which is related to the activity of analyzing the work situation and the environment so that it can be found what products need to be developed, Design is an activity of designing products according to needs, Development is an activity of making and testing products, Implementation is an activity of using products, Evaluation is an activity of assessing whether each step of activities and products that have been made are in accordance with specifications or not. Through these results it can be concluded that the use of the JMI method in learning Mathematics is declared effective because it can have an influence on improving the learning outcomes of elementary school students' numbers.

Keywords:

Jarimatik magic Indonesia
Numeracy
Counting
ADDIE model
Primary education

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## Introduction

Education plays an important role in human development from early childhood to adulthood, especially through the teaching and learning process that lasts throughout life (Nugroho, Muhajang and Budiana, 2020). One of the essential competencies that need to be developed in students is mathematical ability. Mathematics not only includes formulas and concepts, but also logical and systematic thinking skills in solving problems (Siagian, 2016). Mathematics learning is not only cognitive, but also actively involves the body through movement, gesture, and sensory experiences that mediate the construction of meaning in the classroom (Sinclair and Pimm, 2015) The integration of the body in mathematics learning can improve the understanding of abstract concepts to be more concrete and accessible to students. This is in line with recent findings that multisensory approaches such as the

use of hands or concrete media can significantly improve students' numerical understanding (Fajria Septiani, 2024).

TouchMath has been widely used in teaching numeracy for students with various special needs backgrounds, showing consistency in its effectiveness (Dinç Aydemir and Aren, 2017). Multisensory approaches in primary classrooms significantly enhance students' cognitive, social and emotional development. This strategy allows students to learn more effectively by incorporating visual, auditory, kinesthetic, and tactile stimulation in learning (Romaine, 2023). The Touch Math multisensory program assists children at risk of numeracy difficulties in mastering basic computational skills, by increasing their sensory-motor engagement in the learning process (ELawady Abdou, 2020). A multisensory approach to math learning at the primary level significantly improves student performance, by activating multiple sensory modalities that contribute to deeper understanding (Studies, Counselling and For, 2019).

The Touch Math technique is consistently effective in improving basic numeracy skills among students with special needs in various educational settings (Kot et al., 2018). The application of the TouchMath program improved the accuracy and speed of mathematical computations of at-risk students and students with disabilities, thanks to the use of multisensory touch point guidance (Ellingsen, 2017). The use of touch points strategies in teaching single-digit addition operations significantly improved the arithmetic performance of students with special needs, supporting the effectiveness of multisensory-based learning approaches in developing basic numeracy skills (Alghamdi, 2024).

The use of the TouchMath program significantly improved mathematics achievement of students with severe cognitive disabilities, compared to conventional methods, through a systematic multisensory approach (JASMINE, 2014). The application of multisensory technology in STEAM-based learning (Science, Technology, Engineering, Arts, Mathematics) enriches students' learning experience through interactions involving various sensory modalities, enhancing creativity and understanding of complex concepts (Taljaard, 2016).

The low results of international surveys such as PISA and TIMSS indicate the urgency of improvement in numeracy learning. For example, kinesthetic-based concrete methods such as jarimatik can bridge students' abstract understanding of number concepts through the medium of their own bodies (Permana, Renda and Margunayasa, 2020). Studies from (Krenger and Thevenot, 2024) and (Lê, Noël and Thevenot, 2024) show that finger-based methods are more effective than other manipulatives in shaping addition and subtraction skills in early childhood. In fact, (Hutagaol, 2023) emphasized that the Talking Stick method is very effective in increasing student participation and motivation in the classroom.

In response to these conditions, the Ministry of Education and Culture developed a new policy in the education evaluation system through the Minimum Competency Assessment (AKM) which includes reading literacy and numeracy (Sofanudin, Prihastuty and Diniyanto, 2021). However, the results of initial interviews with teachers show that understanding of the concept of numeracy is still limited. In fact, the term numeracy has only been recognized by some teachers since the introduction of the AKM in 2020.

The low numeracy results are not only caused by the low understanding of the concept, but also influenced by the limited learning methods used by teachers in the classroom (Supinah & Wibawa, 2019). Teachers need to have the skills to design and implement contextual and fun methods so that students are more involved in learning mathematics. One innovative approach that can be used is the Jarimatik Magic Indonesia (JMI) method. Several studies prove that this method helps children understand number concepts concretely as well as improve basic numeracy skills (Lia Ariyani, 2019) ; (Himmah, Asmani and Nuraini, 2021); (Björklund, 2024).

One innovative approach that can be used is the Jarimatik Magic Indonesia (JMI) method. This method utilizes fingers as counting aids and has been shown to help children understand number concepts concretely (Krenger and Thevenot, 2025); (Overmann, 2021). The use of fingers has been shown to build basic numeracy skills through strengthening motor memory and quantitative representation (Fischer, Suggate and Stoeger, 2020); (Björklund, 2024). The JMI method can be reinforced with the Talking Stick learning model which is proven to increase students' courage and engagement in group learning (Bete, Bulu and Nahak, 2021); (Yuda and Rosmilawati, 2024). This combinative approach is considered as a strategy that can promote active and fun learning in the lower grades of primary school (Walle et al., 2018).

However, the finger counting method has not been systematically used in primary schools. Therefore, the application of the JMI method combined with the Talking Stick learning model is considered potential to improve students' interest and learning outcomes. This model emphasizes students' activeness, collaboration, and courage in participating (Suprianto, Ahmadi and Suminar, 2019); (Rika Widianita, 2023).

## Methods

This research is a type of research and development (R&D) that aims to develop and test the effectiveness of the Jarimatik Magic Indonesia (JMI) learning method on numeracy material, with a Talking Stick learning model approach. The development model used refers to the ADDIE model which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation (Sugiyono, 2019). ADDIE design is very relevant to develop learning media based on direct practice and concrete experience, as suggested by (Erlangga *et al.*, 2022) in the development of real activity-based numeracy learning.


**Figure 1** ADDIE Development Steps

The Analysis stage was conducted to identify student needs and learning conditions through observations, teacher interviews, and questionnaires to students. The Design stage designs teaching media and evaluation tools. The Development stage involves validation by media experts and material experts, which according to (Karunia Eka Lestari and Ridwan Yudhanegara, 2017) and (R. A. H. Cahyadi, 2019), is very important to ensure the quality of learning instruments. At this stage, the JMI method is combined with Talking Stick to engage students in interactive learning. The use of this model is proven

to be able to improve students' cooperation and courage to express opinions in class (Putri Inantaya, 2021); (Tegeh and Kirna, 2013).Integrated Quantum Mulia. The Evaluation stage evaluates the effectiveness of the method through pretest and posttest.

Statistical tests were conducted with SPSS 26 using the Kolmogorov-Smirnov, Levene, and Wilcoxon tests. The research subjects were 27 third grade elementary school students, and the object of research was students' number learning outcomes.

# Results

## Development of Jarimatik Magic Indonesia Method on Numeration Material with Talking Stick Learning Model in Improving Mathematics Learning Outcomes of Elementary School Students

### *Analysis*

The results of initial observations of Mathematics learning in elementary schools show that student learning motivation tends to be low. This is reflected in the unfavorable situation during the learning process, where some students often go in and out of class and there is noise at the back of the class. In addition, students' interest in learning materials is also lacking as seen from the lack of student response when the teacher explains. As a result, the results of the Mathematics learning evaluation show low student learning achievement, namely only 45 of students who reach the school's KKM standards based on daily test scores.

From the results of observations, the researcher found that the elementary school had never won a math Olympiad competition. The results of the questionnaire survey given to 3rd grade students below show that there are some children who have difficulty in certain indicators. This research procedure begins with conducting an interview with the third grade teacher, the researcher then makes observations at the elementary school. This observation was carried out directly to observe the learning process which included a review of learning methods, subject matter conditions, and learning implementation.

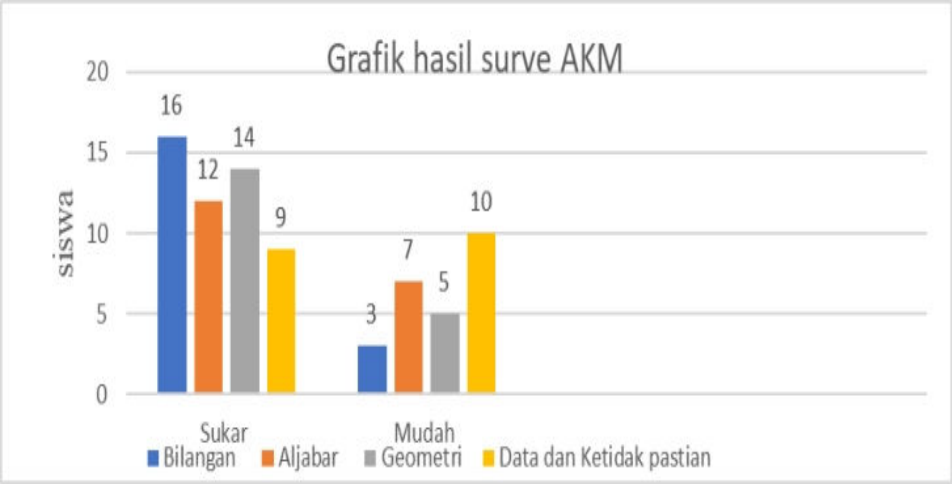



**Figure 2** Survey Results of Difficult and Easy Questionnaires on the Numeration Subtopic of AKM in Elementary Schools

From the results of the researcher's observations through distributing the questionnaire above, the results obtained that AKM in elementary schools is still relatively low. From the results of the number of subtopics only 21 of children are classified as easy. Algebra subtopic only 36 of children are classified as relatively easy. Geometry and measurement subtopic only 26 of children are classified as relatively

easy. Data and Uncertainty subtopic Only 47 of children are classified as easy. So it can be concluded that from all these subtopics, almost the average child still finds it difficult.

The low level of AKM in primary schools is also influenced by several factors, including: 1) Teaching Quality: Teaching methods and teacher competence 2) Curriculum: Curriculum mismatch with AKM standards 3) Learning Facilities and Resources: Inadequate access to books, teaching aids, and information technology 4) Family Environment: Lack of support from parents and home environment in learning 5) Student Motivation and Engagement: Lack of student motivation in learning and active participation in class 6) Socio-economic Conditions: Family economic background that affects students' access to quality education. From the observation, the researcher also found that the elementary school had never won a math Olympiad competition.

The math problem that is often faced by students is the lack of a learning method used by the teacher during the teaching and learning process. Teachers should have made various kinds of developments, especially in learning methods. To realize it all, teachers must be required to have skills in teaching. Teacher skills in teaching are also very necessary, so that a teacher can provide learning to students in a clear, organized and directed manner so that it is easier to understand and not careless in providing teaching. In addition to teaching skills, a teacher must also be required to have the ability to design an effective and easy-to-use learning method during the teaching and learning process. By using a different learning method than before, learning will run optimally in accordance with the learning objectives that have been set so that students will easily understand the material easily.

### *Design*

The Jarimatik Magic Indonesia method is one way of counting using finger tools. With this Jarimatik Magic Indonesia method, students are drilled to memorize basic multiplication. Students' involvement in demonstrating jarimatik can make learning meaningful. They can use their fingers to solve counting problems based on the rules of hand formation and completion of Jarimatik Magic Indonesia. This Jarimatik technique is not only flexible but also does not burden the brain memory in the calculation process, thus showing a high level of accuracy.

The ease of use of the Jarimatik Magic Indonesia technique has an impact on the speed and accuracy in doing counting problems. Besides not using any formulas, the Jarimatik Magic Indonesia method. The application of this technique in math learning will be more memorable and interesting so that it can arouse and foster students' interest in learning. On the other hand, the learning atmosphere will be more lively, communication between teachers and students can be well established so that in the end it will improve counting skills. In the Jarimatik Magic Indonesia method, there are several levels, namely level 1 to level 10 for basic counting methods in elementary school. The purpose of the tiered JMI method is to make it easier for children to count.

### *JMI Method*

The introduction of Jarimatic Magic Indonesia is implemented with fun activities first, for example by singing.

*One finger of my right hand One finger of my left*
*I join two to make a long bridge*
*Two fingers of my right hand Two fingers of my left*
*I join four to make a camera, cekrek*
*Three fingers of my right hand Three fingers of my left*
*I join six to make a tall tower*
*Four fingers of my right hand Four fingers of my left*
*I join eight to make rabbit ears*
*Five fingers of my right hand Five fingers of my left*

*I join ten to make a crowd*
*Prok... prok... prok....*

*Number Symbol*

After the children are invited to sing, the children are introduced to the number symbols and how to write them:

There is 1 Bird

There Are 4 Apples

**Figure 3** Introduction of Numbers and Number Symbols

In the introduction of numbers and number symbols, avoid explaining using hand drawings because the child will experience confusion because later it will be used for the Indonesian Magic Jarimatik method.

*JMI Steps*

The introduction of addition number signs in Jarimatik Magic Indonesia for addition is a reading movement.

Become

**Figure 4** Introduction of the Subtraction Number Symbol in Jarimatik Magic Indonesia is the Closing Movement.

Become

**Figure 5** Application of the Fingers of the Right and Left Hand in the Jarimatik Magic Indonesia Method

At level 1 there are several things that will be taught, namely about units, tens and hundreds of how to apply them in Jarimatik Magic Indonesia. The application of level 1 about units is in the right hand with a count starting from 1 to 9.

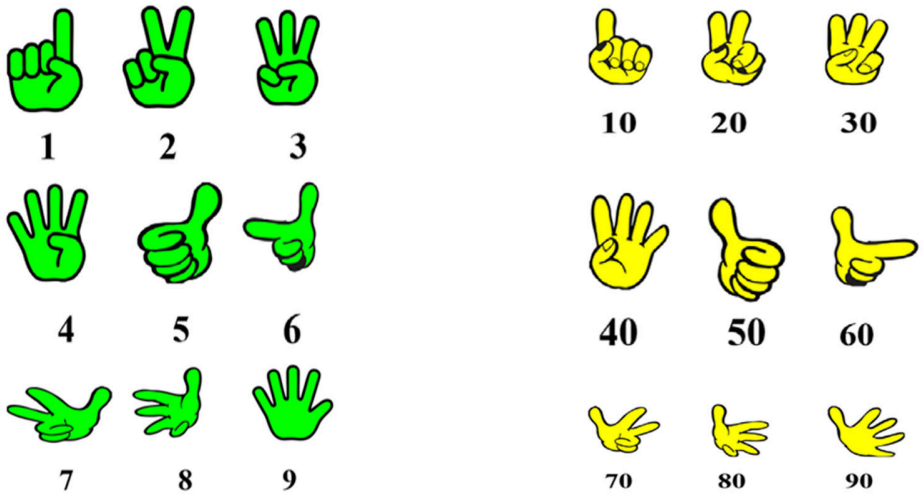



**Figure 6** Level 1 Application of Tens is on the Left Hand with A Count of 10 to 90

In using Jarimatik Magic Indonesia for hundreds, use the left hand position because we only have two hands, the right hand and the left hand. The use of the left hand for hundreds is like being assisted if later we have a count of more than one hundred. The application is as follows:

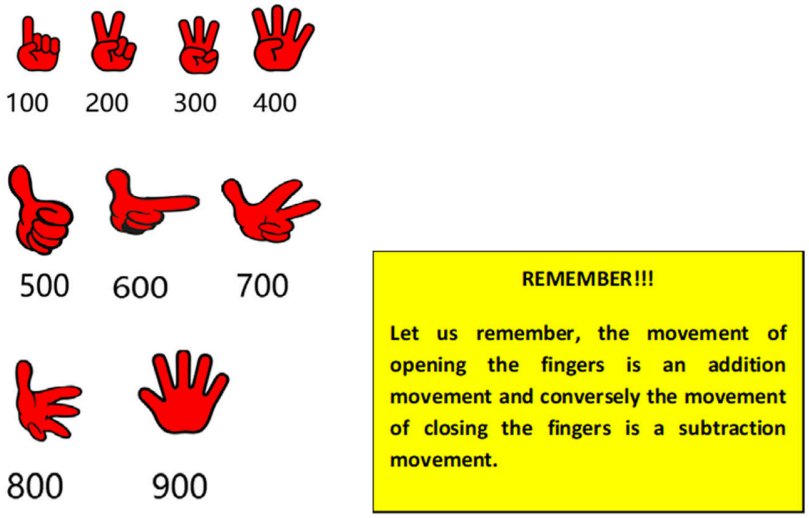



**Figure 7** Example of using tens and units fingers

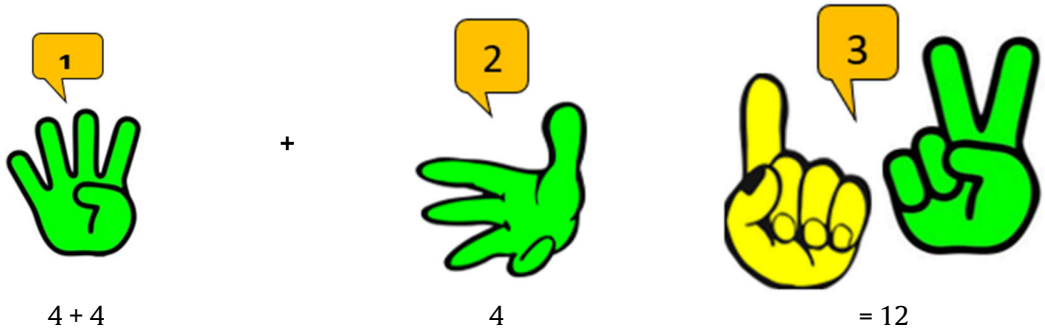

**Figure 8** Units Storage

When we will apply hundreds, we will store the units, for example 175, 100 in the left hand is stored in memory and 70 in the right hand for unit 5 in the left hand.


Written in 175

**Figure 9** The Place Value of 100 is Stored in Memory.

3x4 = 12 means 3 times the sum of 4 written 4+4+4 = 12. There are: (1) Open the fingers of the right hand one to four from the index finger to the little finger; (2) Then because it is added, open the finger count one to four from the thumb of the right hand to the ring finger of the right hand; (4) Add 4 again, then open the count one to four again, starting from the little finger because it stores tens, then open the index finger of the left hand as the value of 10 and the left hand closes all then count again two fingers on the index finger and the middle finger of the right hand, then the result is 12.

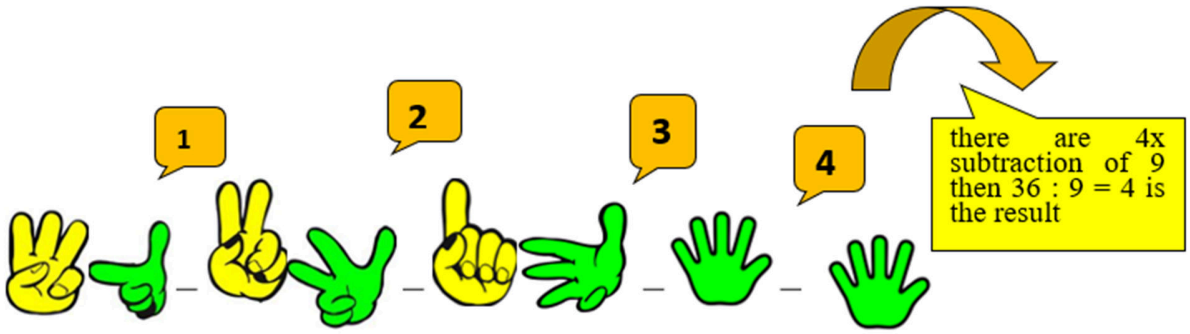



4 + 4 4 = 12

**Figure 10** More Counting with Hands

36:9 = 4; Meaning 36-9-9-9-9-0. The explanation could be: (1) Open the fingers of the left hand, count one to three from the index finger to the ring finger of the left hand; (2) Open the fingers of the right hand, count from the index finger to the index finger of the right hand; (3) Close the fingers of the count of one to nine starting from the index finger of the right hand until the count of six on the index finger of the right hand because the position of the unit has closed everything, therefore closing one finger of the left hand which means taking a value of 10 (the right hand fingers open everything from the index finger of the right hand to the ring finger of the right hand) with a quiet sound then counted to nine loud sounds 1 that 1 division; (4) Closing the finger count of one to nine from the middle finger of the right hand, the count is only eight, then the unit position closes all, therefore closing one finger of the left hand, one finger of the left hand, meaning taking the value of 10 (the right hand fingers open all from the index finger of the right hand to the ring finger of the right hand) with a quiet sound, then counted to nine with a loud sound, 2 kinds of 2 divisions; (5) The left hand closes from the count of one to nine, starting from the right ring finger to the index finger of the right hand with a quiet voice, then

counts to nine with a loud voice, 4 of them 4 Divisions because position one has closed everything, then the Division is 36:9 = 4.




36- 9 – 9 – 9 – 9 = 0

**Figure 11** The Left Hand Closes from the Count of One to Nine

### *Development*

This stage is a step to improve the product that has been designed at the design stage, while accommodating input and suggestions from experts. This stage includes several product validations, which evaluate the feasibility of the product that has been developed as a learning resource. After that, revisions were made based on input and suggestions from the validator team. Verification was carried out by methodology experts and material experts.

Assessor 1 and Assessor 2 conducted media validation to assess the feasibility of the media used in the Jarimatik Magic Indonesia method during the learning process. Meanwhile, Assessor 1 and Assessor 2 were in charge of conducting material validation and verification which aimed to assess the feasibility and applicability of using the media as learning media.

### *Media Expert Validation Results*

The Material Expert, Appraiser 1. And Appraiser 2 validated the developed media method by distributing learning aspects and material substance aspects.

**Table 1.** Media Expert Validation Results

| No. | Item Assessment | Validator 1 | Validator 2 | Average |
|---|---|---|---|---|
| General Aspects | | | | |
| 1 | Creative and innovative (new, flexible, interesting, smart, unique, and not different) | 5 | 4 | 4,5 |
| 2 | Communicative (easy to understand and uses good, correct, and effective language) | 5 | 5 | 5 |
| 3 | Superior (has advantages over other learning methods or conventional methods) | 5 | 4 | 4 |
| Special Aspects | | | | |
| 4 | Effective and efficient development and use of learning methods | 4 | 4 | 4 |
| 5 | Reliability | 4 | 4 | 4 |
| 6 | Usability (easy to use and simple to operate) | 5 | 4 | 4,5 |
| 7 | Creative | 5 | 4 | 5 |
| 8 | Simple | 5 | 4 | 4,5 |
| Total Score | | 38 | 33 | 35 |
| Percentage | | **95** | **83** | **87,5** |



iiCET

Based on the results of media validation, a score of 87.5 was obtained, which indicates that the method that has been developed is in the category of very feasible to use without the need for further revision. This means that this method can be used for learning in Class III of Quantum Mulia Integrated Islamic Elementary School. Validation by methodologists includes 2 aspects, namely general aspects (including creative, innovative, communicative, superior) and specific aspects (including effective, efficient, realistic, useful, simple). Overall, the assessment results from all aspects obtained a total score of 87.5 , seen from the eligibility category according to (Sugiyono, 2019), the categorization is very feasible overall.

### *Material Expert Validation Results*

Material experts, validator 1 and validator 2 validated the material developed by distributing learning aspects and material substance aspects.

**Table 2**. Material Expert Validation

| Item Rating | Rating Criteria | | Average |
|---|---|---|---|
| | Appraiser 1 | Appraiser 2 | |
| Clarity of learning objectives (reliability and measurability) | 4 | 4 | 4 |
| Learning Aspects | | | |
| Relevance of learning objectives to the curriculum | 4 | 4 | 4 |
| Scope and depth of learning objectives | 5 | 5 | 5 |
| Appropriateness of the use of learning strategies | 5 | 5 | 5 |
| Interactivity | 4 | 4 | 4 |
| Contextuality | 5 | 4 | 4,5 |
| Completeness and quality of learning aids | 4 | 5 | 4,5 |
| Appropriateness between material, methods and evaluation with learning objectives | 4 | 5 | 4,5 |
| Ease of understanding | 4 | 5 | 4,5 |
| Sequential, logical, and clear systematics | 5 | 5 | 5 |
| Clarity of description, discussion, examples, simulations and exercises | 4 | 5 | 4,5 |
| Consistency of evaluation with learning objectives | 4 | 5 | 4,5 |
| Relevance and consistency of evaluation tools | 4 | 5 | 4,5 |
| Providing feedback on evaluation results. | 4 | 5 | 4,5 |
| The correctness of the material in theory and concept | 4 | 5 | 4,5 |
| Accuracy of the use of terms according to the scientific field | 4 | 5 | 4,5 |
| Depth of material | 3 | 5 | 4 |
| Reality | 4 | 4 | 4 |
| Total | 83 | 88 | 85,5 |
| Percentage | 92 | 97 | 95 |

Based on the results of material validation, a score of 95 was obtained, indicating that the method developed is in the category of very feasible to use without the need for further revision. This means that this method can be used for learning in elementary schools.

### *Implementation*

After validating the Jarimatik Magic Indonesia method book, the next step is to test the application of the Jarimatik Magic Indonesia Method Book product in learning for third grade elementary school students totaling 27 students. The implementation steps are as follows:

**Table 3.** Learning Activities

| Learning Activities | Learning Steps |
|---|---|
| Initial Activity (Introduction) | Setting the learning atmosphere<br>a. Begin with prayer<br>b. Greetings or greetings to students<br>c. Attendance<br>d. Lighter questions<br>e. Teacher conveys learning objectives and asks about yesterday's learning.<br>f. Teacher conducts icebreaking on students' readiness with 1 clap, 2 claps and so on. |
| Core Activities | Learning Activities<br>a. The teacher directs the students to count the pencil drawings then apply them in jarimatika in counting them<br>b. The teacher repeats the numbers 1 to 90 with the jarimatik method<br>c. The teacher gives directions in the division of groups for learning with the talking stick model.<br>d. One group is male and the second group is female e. The first male group plays first f. One group is male and the second female e. The first male group plays first. One group is male and the second group is female<br>e. The male group plays first<br>f. With a circle formation, students sing while directing small sticks to rotate alternately until the song is finished.<br>g. The child holding the last stick gets a multiplication problem for example 3x4<br>h. This is done for several songs<br>For the women's group, it was the same |
| Closing Activities | a. The teacher asks questions as an evaluation<br>b. Thanking students for following the lesson in an orderly manner.<br>c. ReflectingFinal lesson on wheels<br>d. Greetings |

**Figure 12** JMI Learning Activities using Talking Stick

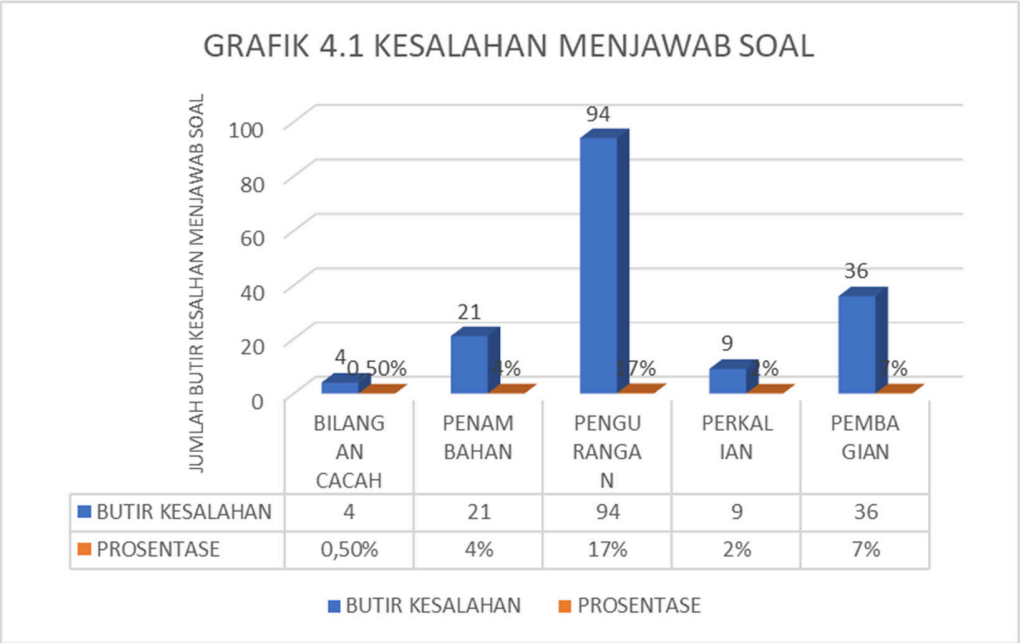



**Figure 13** Percentage of Errors with Number of Questions 1 to 20

From the graph above, it can be seen that the data for question items with the most errors were answered by students in questions no. 6, 7, 14 and 17.

*Student Response to the Magic Indonesia Jarimatic Method*

This response test was conducted on 27 third grade elementary school students. Data collection was carried out through a student response questionnaire to the method that had been developed. The small-scale test questionnaire includes several aspects described in the following table:

**Table 4.** Student Questionnaire Results

| Aspect | Number | Total Score | Presented (%) | Category |
|---|---|---|---|---|
| Presentation | 1 | 33 | 94 | Very Feasible |
| | 2 | 34 | 97 | Very Feasible |
| | 3 | 34 | 97 | Very Feasible |
| | 4 | 35 | 100 | Very Feasible |
| | 5 | 35 | 100 | Very Feasible |
| | 6 | 35 | 100 | Very Feasible |
| | 7 | 35 | 100 | Very Feasible |
| | 8 | 31 | 88 | Very Feasible |
| | 9 | 35 | 100 | Very Feasible |
| Usage | 10 | 35 | 100 | Very Feasible |
| | 11 | 29 | 82 | Worth |
| | 12 | 35 | 100 | Very Feasible |
| | 13 | 28 | 80 | Worth |
| | 14 | 35 | 100 | Very Feasible |
| | 15 | 33 | 94 | Very Feasible |
| | 16 | 27 | 77 | Worth |
| | 17 | 33 | 94 | Very Feasible |
| | 18 | 35 | 100 | Very Feasible |

| | Number | Total Score | Presented (%) | Category |
|---|---|---|---|---|
| | 19 | 35 | 100 | Very Feasible |
| | 20 | 32 | 91 | Very Feasible |
| | 21 | 35 | 100 | Very Feasible |
| | 22 | 32 | 91 | Very Feasible |
| | 23 | 33 | 94 | Very Feasible |
| | 24 | 33 | 94 | Very Feasible |
| | 25 | 33 | 94 | Very Feasible |
| | 26 | 33 | 94 | Very Feasible |
| | 27 | 25 | 71 | Worth |
| Total | | 888 | 2532 | |
| Average | | 32,88 | 93 | |

Based on the data above, it was found that the developed method was suggested to be very feasible with an average score of 93 .

**Table 5.** Student Interview Results

| Aspect | Description |
|---|---|
| Enthusiasm | a. Fun use of JMI method<br>b. JMI uses finger media |
| Motivation | a. Students are easier to count with jarimatik magic indonesia<br>b. Students can calculate multiplication and division |
| Obstacles | a. There are 5 students counting the multiplication of tens and hundreds of units<br>b. There are 7 students who have forgotten to open and close the fingers in repeated addition and subtraction operations.<br>c. There are 10 students who do not know that the name of the finger counting method used is the Indonesian magic jarimatik method.<br>d. There is 1 student who lacks the practice and use of the Indonesian magic jarimatik method by students |

The following is a table of conversations that show the obstacles in counting with Jarimatik Magic Indonesia. The following are the results of the analysis of interviews with students who show obstacles in counting with Jarimatik Magic Indonesia:

Teacher : What difficulties did you encounter when learning jarimatik magic indonesia?
Student 1 : Difficulty in multiplying tens and hundreds mom
Teacher : Why is it difficult?
Student 1 : Because the multiplication of tens and hundreds has to save
Student 2 : I experience forgetfulness when opening and closing the fingers
Teacher : Why forget
Student 2 : Lack of practice ma'am
Student 3 : I don't know that the name of the method used is The Magic Indonesian Jarimatik Method
Teacher : You will write the name of the method in the book
Student 4 : I don't know repeated addition
Teacher : What is an example?
Student 4 : 5+5+5+5+5

In the obstacles experienced by student 1, the multiplication of tens and hundreds is due to difficulty in coloring the shadow of hundreds, student 2 because of the difficulty in opening and closing the fingers, of course this student lacks practice, while student 3 does not know that the method used in counting with fingers is the magic jarimatik method of Indonesian because he does not pay attention to the name of the method used and for student 4 does not know the number of repeated pens because it requires personal help in learning from other students.

For each obstacle experienced by students, the researcher describes how the solution is done to overcome these obstacles. The following is a table of the solutions described:

**Table 6.** Constraints

| Obstacle | Solution |
|---|---|
| Calculating multiplication of tens and hundreds | In the multiplication of tens and hundreds, students are encouraged to record in a notebook so that they do not forget and do not burden their memory. |
| Experiencing forgetfulness when opening and closing fingers when doing addition and subtraction repeatedly | 1. Students are invited to repeat the movement slowly |
| Students do not know that the name of the finger counting method used is the Indonesian magic jarimatik method. | 2. Students are accompanied until they memorize and remember not to forget the questions that contain multiplication and division so that they can continue to remember |
| Students do not know and understand addition and subtraction repeatedly | Students write the full name of the Jarimatik Magic Indonesia method in the notebook so that students understand that the method used is the Jarimatik Magic Indonesia Method not counting with fingers.<br>1. First, students are taught privately with slow movements how to open and close the fingers in Jarimatik Magic Indonesia<br>2. Secondly, students are asked to try to solve easy problems first<br>3. Thirdly, repeating until students understand and comprehend |

*Teacher's Response to the Indonesian magic Jarimatic Method*

**Table 7.** Teacher Questionnaire Results

| No | Indicator | Value |
|---|---|---|
| 1 | Compatibility of JMI method with CP | 4 |
| 2 | Compatibility of JMI method with ATP | 4 |
| 3 | Compatibility of JMI method with indicators | 4 |
| 4 | Compatibility of JMI method with learning objectives | 4 |
| 5 | JMI method has the right coverage | 4 |
| 6 | JMI method is presented systematically | 5 |
| 7 | JMI method can clarify the material | 5 |
| 8 | The level of difficulty contained in the JMI method is in accordance with the cognitive development of elementary school students. | 5 |
| Total Score | | 35 |
| Percentage | | 87,5 |

The results of the material validation showed a score of 87.5 which indicates that the material included in the developed Indonesian magic jarimatika method is declared feasible and valid for use in learning activities.

Sourced from the teacher's response with a questionnaire, an overall score of 87.5 was obtained. Each point measured by practitioners consists of several indicators. Judging from the eligibility category, according to (Sugiyono, 2019), it is included in the category of very feasible overall and in accordance with the benefits of learning methods, namely making it easier for students to convey material, so that students absorb lessons more easily, can reduce obstacles for teachers and students during learning, can improve the quality of student learning, can improve student learning outcomes and the learning process becomes more interesting. The following are the results of the teacher interview:

**Table 8.** Results of Teacher Questionnaire Analysis

| Aspect | Description |
|---|---|
| Preparation | Using interesting, fun learning and utilizing the right methods and media<br>Using the right methods |
| Core Learning | Learning outcomes are important in learning. |
| Challenge | Important factors that influence learning are motivation, and skills. |

To overcome the teacher's challenges in learning, the researcher provides the following solutions:

**Table 9.** Results of Teacher Questionnaire Analysis

| Challenge | Solution description |
|---|---|
| Internal factors are one's own readiness to learn and external factors are factors that influence from outside such as teachers, friends, classroom atmosphere, and so on. | This factor can be taken by personal assistance for certain students who have difficulty or are slow in receiving learning material. |
| The obstacles experienced in learning methods are time consuming, lack of teacher readiness in teaching, students are less serious. | The factor of student characteristics does greatly affect learning, but teachers must prepare in advance before learning so that learning is easily understood by students, proper preparation such as media readiness, readiness of methods and strategies that are suitable for children whose characteristics are slow in absorbing learning material. |

## *Evaluation*

Evaluation is applied in assessing the feasibility of interactive learning media. This process takes place from the first stage of research to the fourth stage. The assessment results are in accordance with the data obtained from the data analysis and the respondents' feasibility refers to the specified requirements. For the overall product evaluation, the suggestions and comments of JMI method are very important. The researcher will explain some advantages and disadvantages of the product.

### *Product Advantages*

Referring to the trial stages and the results of the product trial analysis as well as various inputs are the main sources in developing product excellence in the form of: (1) JMI provides visualization of the calculation process, this will make it easier for students to do; (2) Finger movements will attract students' interest, maybe they think it is funny so they will do it happily; (3) JMI relatively does not relax the brain memory when used.

### *Product Disadvantages*

The researchers certainly realized various shortcomings in product development with reference to product comments and test results in the form: (1) It takes a long time to reach higher levels; (2) Not all problems can be solved with jarimatics; (3) It takes a lot of patience to learn it.



iiCET

**The results of this research and development are presented according to the ADDIE phases with an emphasis on results and evaluation.**

The Jarimatik Magic Indonesia method development research was conducted to develop a counting method with fingers that creates interest for students. The research discussion consists of the feasibility of using the Jarimatik Magic Indonesia method, the practicality of the Jarimatik Magic Indonesia method and the effectiveness of using the Jarimatik Magic Indonesia method.

The Jarimatik Magic Indonesia method is valid for providing learning experiences as it involves students directly in learning activities, such as answering questions, completing interactive tasks, or participating in simulations. This allows students to learn through direct experience, which can strengthen their understanding of the subject matter. This is taken from the table data in the material validation assessment. The learning model that builds knowledge and skills through direct experience or experiential learning (A. Cahyadi, 2019). The Jarimatik Magic Indonesia Method as outlined in a guidebook for the Jarimatik Magic Indonesia Method developed is also said to be valid because it shows that it can optimize numeracy facilities according to the media validation assessment. This is evidenced by previous research also showing that the jarimatika method improves numeracy or math learning outcomes (Indiastuti, 2021).

The Indonesian magic jarimatik method shows practical use in learning because the method is presented systematically because it has organized, logical and sequential elements where systematic learning is needed to achieve the best learning outcomes. A lesson really needs a systematic learning method in the table of the results of the teacher's anget analysis explained that learning itself must use a systematic presentation. According to (R. A. H. Cahyadi, 2019) where the method must be systematic so that it is easy to apply.

The Jarimatik Magic Indonesia method has a practical value because it clarifies math material, especially about numbers as shown in the table of analysis of teacher questionnaires and student questionnaires with a score of five, The application of the jarimatika technique clarifies the multiplication counting material which means repeated addition. Jarimatik Magic Indonesia method is a practical counting technique because it is used without tools and is relatively cheap or free because of the fingers as the medium, in accordance with the interview table with the principal and students, Jarimatika method provides the easiest and cheapest understanding of counting only by hand (Rosiyana and Umi Nurbaeti, 2023). In addition, the Jarimatik Magic Indonesia method has a practical value in helping students learn actively and independently in the interview table with students, The jarimatika method of counting with knuckles in counting makes students active and independent where students are physically involved and express opinions independently because of the concrete learning media, namely fingers. In the jarimatik magic indonesia method is practical in learning math because it helps counting according to the interview table with the teacher, the jarimatik magic indonesia method is needed in learning math to count because it is easy to implement. The jarimatika method is practically used to improve students' counting ability (Salsinha et al., 2023).

The jarimatik magic indonesia method is effective to be applied in teaching because it is able to improve math learning outcomes according to the table in this case, previous studies have also found that math learning outcomes can be improved with finger math techniques (Bete, Bulu and Nahak, 2021).

The effectiveness of the JMI method can be explained through cognitive and constructivistic theoretical approaches. According to (Overmann, 2021) and (Fischer, Suggate and Stoeger, 2020), the use of fingers in learning builds a bridge between sensorimotor and mental representations, thus improving the understanding of number concepts concretely. The Talking Stick model as an amplifier of verbal participation helps reduce anxiety and builds students' courage to answer, in line with the findings of (Nurmaulidyah, Mutia, Dalle Ambo, 2019) who stated that this model is effective in encouraging interaction and collaboration.

The results of this study show that the JMI method makes a real contribution to improving student learning outcomes. This supports the research results of (Chusnah and Desiningrum, 2024) and (Overmann, 2021), which show that physical activity-based and sensorimotor learning can improve students' retention in understanding number concepts. In addition, integration with Talking Stick provides a fun and challenging learning atmosphere (Wulandari, 2021).

Furthermore, this research is also in line with a study by Anggraini & amp; Sari (2020) which states that the use of concrete tools such as fingers is very helpful for students in understanding basic arithmetic operations, especially for low-grade students who are still in the concrete operational stage according to Piaget (1972). With this combinative approach, teachers do not only teach math as memorization of formulas, but also shape students' conceptual thinking from an early age (Ardianingtyas and Rulviana, 2024) (Walle et al., 2018). In addition, this model can significantly increase students' emotional engagement and learning motivation (Hasanah, 2018) (Wahyuni, Norawati and Marantika, 2024).

This finding supports the research results of (Hilton, 2024), that the use of physical aids such as fingers is more effective for children than other manipulatives, especially in the context of basic addition and subtraction. From a theoretical perspective, this study strengthens the literature on the effectiveness of concrete methods in learning numeracy for primary school-age children. The findings also suggest that the integration of sensorimotor-based counting methods with participatory models can significantly improve the effectiveness of mathematics learning.

Practically speaking, the JMI method can be applied in schools with limited teaching aids because it only requires the students' own bodies. This makes it an inclusive, inexpensive, and flexible method. Teachers can use it as a main or supporting method, especially on basic topics such as numbers, addition, subtraction, and multiplication.

This study has some limitations that need to be explicitly acknowledged including small sample size of 27 students which limits the generalizability of the findings, teacher influence and classroom atmosphere which can affect the results and introduce bias in measurement, short duration of the study which has not observed long-term effects or learning retention, no control group was conducted which limits the power of causal inference experimentally. Nonetheless, validation and statistical tests show that the JMI method has significant potential to improve learning outcomes, and can be the basis for larger-scale follow-up research.

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## Conclusion

The use of the Jarimatik Magic Indonesia method combined with the Talking Stick learning model effectively improves the numeracy skills of grade III elementary school students. This finding

strengthens the recommendations of (Wahyuni, 2020) and (Hilton, 2024), which emphasize the importance of active and fun approaches in learning mathematics in primary schools. The recommendations from this study encourage the wider application of the JMI and Talking Stick combinative method, as well as further development in a digital context or integration with educational games (Putra, 2022) (Fischer, Suggate and Stoeger, 2020).

With this approach, learning mathematics becomes more understandable, interesting, and inclusive for all learners. Based on the results of the trial and data analysis, it can be concluded that the Jarimatik Megic Indonesia method is valid to be used for learning mathematics for grade III students' numeracy to improve the results of school numbers. Jarimatik Magic Indonesia method is practical to use as improving number learning outcomes in elementary schools through math teaching strategies. The trial results show that the post test group is better than the pretest group results. Based on these findings, it can be said that the JMI method in math teaching is successful because it positively affects the numerical learning outcomes of primary school students.

The development of the JMI method in mathematics education significantly improves student learning outcomes and is beneficial. But it does not rule out the possibility to be developed further. As a reference for research and as material for consideration to further use the JMI approach to conduct more in-depth research and is expected to always support and be able to increase the professionalism of teachers in using learning methods so that goals can be achieved. Teachers seek private assistance for certain students who have difficulty or are slow to accept learning material and prepare in advance before learning so that learning is easily understood by students, such as media readiness, readiness of methods and strategies that are suitable for children whose characteristics are slow in absorbing learning material. The usefulness of research findings in the field or scope of study or in the advancement of science is an example of implication, which is a logical result. The JMI method can help students improve their counting skills more quickly and accurately. The use of the Jarimatik Magic Indonesia method is a fun and easy-to-understand method. JMI uses finger media The JMI method can make learning math more fun, interactive and interesting, thus increasing students' learning motivation. The JMI method can help develop students' logical, analytical, and critical thinking skills in solving math problems.

## References

Alghamdi, A.S. (2024) 'Evidence-based practices: using the touch points strategy to teach single-digit addition to students with ASD', *Humanities and Social Sciences Communications*, 11(1), pp. 1–10. Available at: https://doi.org/10.1057/s41599-023-02460-w.

Ardianingtyas, O.D. and Rulviana, V. (2024) 'Meningkatkan Hasil Belajar Perkalian Matematika Siswa Kelas V di Sekolah Inklusi dengan Penerapan Metode Jarimatika', 1(4).

Bete, M., Bulu, V.R. and Nahak, R.L. (2021) 'Pengaruh Metode Jarimatika Terhadap Hasil Belajar Perkalian Siswa Kelas Iii Sd Inpres Sikumana 3 Kupang', *SPASI: Jurnal MahasiswaPendidikan Dasar*, 86(1), pp. 87–88.

Björklund, C. (2024) 'Finger use mirroring young children's ways of experiencing numbers', *Journal of experimental child psychology*, 249, p. 106076. Available at: https://doi.org/10.1016/j.jecp.2024.106076.

Cahyadi, A. (2019) 'Pengembangan Media dan Sumber Belajar: Teori dan Prosedur', *Laksita Indonesia*, p. 3.

Cahyadi, R.A.H. (2019) 'Pengembangan Bahan Ajar Berbasis Addie Model', *Halaqa: Islamic Education Journal*, 3(1), pp. 35–42. Available at: https://doi.org/10.21070/halaqa.v3i1.2124.

Chusnah, A. and Desiningrum, N. (2024) 'Pengaruh Metode Jarimatika terhadap Kemampuan Berhitung Perkalian Dasar Siswa Kelas V SDN Pakis V Surabaya', 4, pp. 4332–4344.

Dinç Aydemir, S. and Aren, S. (2017) 'Do the effects of individual factors on financial risk-taking behavior diversify with financial literacy?', *Kybernetes*, 46(10), pp. 1706–1734. Available at: https://doi.org/10.1108/K-10-2016-0281.

ELawady Abdou, R.A. (2020) 'The effect of Touch Math multi-sensory program on teaching basic computation skills to young children identified as at risk for the acquisition of computation skills', *Revista Amazonia Investiga*, 9(27), pp. 149–156. Available at: https://doi.org/10.34069/ai/2020.27.03.15.

Ellingsen, R.C.E. (2017) 'Using the TouchMath Program to Teach Mathematical Computation to At-Risk Students and Students with Disabilities', *Educational Research Quarterly*, 41(1), pp. 15–42.

Erlangga, F. *et al.* (2022) 'Pengembangan Desain Instruksi Pembelajaran dengan Model ADDIE untuk Pendidikan Anak Usia Dini', *Sinasis*, 3(1), pp. 261–267.

Fajria Septiani, P.Y. (2024) 'Pembelajaran Dengan Etnomatematika Dalam Meningkatkan Pemahaman Konsep Matematika Abstrak', *Inovasi Pendidikan*, 11(1), pp. 59–64. Available at: https://doi.org/10.31869/ip.v11i1.5649.

Fischer, U., Suggate, S.P. and Stoeger, H. (2020) 'The Implicit Contribution of Fine Motor Skills to Mathematical Insight in Early Childhood', *Frontiers in Psychology*, 11(June), pp. 1–15. Available at: https://doi.org/10.3389/fpsyg.2020.01143.

Hasanah, U. (2018) 'Strategi Pembelajaran Aktif Untuk Anak Usia Dini', *INSANIA : Jurnal Pemikiran Alternatif Kependidikan*, 23(2), pp. 204–222. Available at: https://doi.org/10.24090/insania.v23i2.2291.

Hilton, C. (2024) 'A longitudinal study of the role of fingers in the development of early number and arithmetic skills in children with Apert syndrome', *Journal of Anatomy*, (July), pp. 914–929. Available at: https://doi.org/10.1111/joa.14111.

Himmah, K., Asmani, J.M. and Nuraini, L. (2021) 'Efektivitas Metode Jarimatika dalam Meningkatkan Kemampuan Berhitung Perkalian Siswa', *Dawuh Guru: Jurnal Pendidikan MI/SD*, 1(1), pp. 57–68. Available at: https://doi.org/10.35878/guru.v1i1.270.

Hutagaol, G.G.T. (2023) 'Pengaruh Model Pembelajaran Talking Stick Terhadap Hasil Belajar Siswa Kelas Ii Sd Negeri 122371 Pematang Siantar', *Pengembangan Penelitian Pengabdian Jurnal Indonesia*, 1(1), pp. 87–96.

Indiastuti, T. (2021) 'Pengaruh Metode Jarimatika Perkalian Pada Pelajaran Matematika Terhadap Hasil Belajar MIN 1 Madiun', *ISEJ: Indonesian Science Education Journal*, 2(3), pp. 137–143.

JASMINE, K. (2014) '済無No Title No Title No Title', *Penambahan Natrium Benzoat Dan Kalium Sorbat (Antiinversi) Dan Kecepatan Pengadukan Sebagai Upaya Penghambatan Reaksi Inversi Pada Nira Tebu* [Preprint].

Karunia Eka Lestari and Ridwan Yudhanegara, M. (2017) 'Analisis Kemampuan Representasi Matematis Mahasiswa pada', *Jurnal Matematika Integratif*, 13(1), pp. 28–33. Available at: https://doi.org/10.24198/jmi.v13.n1.11410.28-33.

Kot, M. *et al.* (2018) 'Effectiveness of Touch Math Technique: Meta-Analysis Study', *European Journal of Special Education Research*, 3(4), pp. 100–111. Available at: https://doi.org/10.5281/zenodo.1326894.

Krenger, M. and Thevenot, C. (2024) 'The use of fingers in addition: A longitudinal study in children from preschool to kindergarten', *Cognitive Development*, 70(August 2023), p. 101431. Available at: https://doi.org/10.1016/j.cogdev.2024.101431.

Krenger, M. and Thevenot, C. (2025) 'Do children need counting principle knowledge to count on their fingers?', *Journal of Experimental Child Psychology*, 249, p. 106073. Available at: https://doi.org/10.1016/j.jecp.2024.106073.

Lê, M.L., Noël, M.P. and Thevenot, C. (2024) 'The efficacy of manipulatives versus fingers in supporting young children's addition skills', *Journal of Experimental Child Psychology*, 244(April), p. 105931. Available at: https://doi.org/10.1016/j.jecp.2024.105931.

Lia Ariyani (2019) *Pengaruh Media Konkret Terhadap Hasil Belajar Siswa Pada Mata Pelajaran Ipa Kelas Iv Sdn 105323 Bakaran Batu Kecamatan Batang Kuis Kabupaten Deli Serdang*.

Nugroho, M.A., Muhajang, T. and Budiana, S. (2020) 'Pengaruh Minat Belajar Siswa Terhadap Hasil Belajar Mata Pelajaran Matematika', *JPPGuseda | Jurnal Pendidikan & Pengajaran Guru Sekolah Dasar*, 3(1), pp. 42–46. Available at: https://doi.org/10.33751/jppguseda.v3i1.2014.

Nurmaulidyah, Mutia, Dalle Ambo, F.S. (2019) 'Penerapan Model Pembelajaran Kooperatif Tipe Talking Stick Dalam Keterampilan Berbicara Bahasa Jerman Siswa Kelas XI Sma Negeri 2 Majene', *Diploma thesis, Universitas Negeri Makassar.*, pp. 1–18.

Overmann, K.A. (2021) 'Finger-Counting and Numerical Structure', *Frontiers in Psychology*, 12(September), pp. 1–5. Available at: https://doi.org/10.3389/fpsyg.2021.723492.

Permana, K.B.A., Renda, N.T. and Margunayasa, I.G. (2020) 'Model Pembelajaran Kolaboratif Meningkatkan Hasil Belajar Matematika Siswa', *Jurnal Pedagogi dan Pembelajaran*, 3(2), p. 223. Available at: https://doi.org/10.23887/jp2.v3i2.26552.

Putra, I.S. (2022) 'Kontribusi Penggunaan Metode Jarimatika Dalam Meningkatkan Kemampuan Numerik Siswa SMP', *Jurnal Pembelajaran Matematika Inovatif*, 5(1), pp. 55–64. Available at: https://doi.org/10.22460/jpmi.v5i1.55-64.

Putri Inantaya, R. (2021) 'Pengembangan Modul Ajar Pemrograman Berorientasi Objek Dengan Menggunakan Model Addie Pada Prodi Pendidikan Teknologi Informasi Uin Ar-Raniry', pp. 1–23.

Romaine, A. (2023) 'Student Development The Role of Multi-Sensory Learning in Elementary Classrooms on Student Development', 17, pp. 59–72.

Rosiyana, M. and Umi Nurbaeti, R. (2023) 'Pelatihan Berhitung Cepat dengan Metode Jarimatika bagi Siswa Sekolah Dasar Desa Cigadung', *JAMU : Jurnal Abdi Masyarakat UMUS*, 3(02), pp. 88–94. Available at: https://doi.org/10.46772/jamu.v3i02.918.

Salsinha, C.N. *et al.* (2023) 'Penggunaan Metode Jarimatika Sebagai Inovasi Dalam Peningkatan Kemampuan Berhitung Bagi Siswa Sd', *JMM (Jurnal Masyarakat Mandiri)*, 7(6), p. 5831. Available at: https://doi.org/10.31764/jmm.v7i6.19199.

Siagian, M.D. (2016) 'Kemampuan koneksi matematik dalam pembelajaran matematika', *MES: Journal of Matematics Education and Science2*, 2(1), pp. 58–67.

Sinclair, N. and Pimm, D. (2015) 'Mathematics using multiple senses: Developing finger gnosis with three- and four-year-olds in an era of multi-touch technologies', *Pacific Early Childhood Education Research Association*, 9(3), pp. 99–110. Available at: https://doi.org/10.17206/apjrece.2015.9.3.99.

Sofanudin, A., Prihastuty, R. and Diniyanto, A. (2021) 'Teachers Engagement of Madrasah Aliyah's Teachers In Learning During Covid-19', *Jurnal Ilmiah Didaktika*, 21(2), pp. 140–150.

Studies, C., Counselling, O.F. and For, I. (2019) 'The Educational Beacon ISSN 2582-3515 Vol . 8 January 2019- Peer Reviewed and Refereed Journal The Educational Beacon ISSN 2582-3515 Vol . 8 January 2019- Peer Reviewed and Refereed Journal', 8(January), pp. 14–23.

Sugiyono, D. (2010) *Metode penelitian kuantitatif kualitatif dan R&D*, *Penerbit Alfabeta*.

Suprianto, A., Ahmadi, F. and Suminar, T. (2019) 'The development of mathematics mobile learning media to improve students' autonomous and learning outcomes', *Journal of Primary Education*, 8(1), pp. 84–91.

Taljaard, J. (2016) 'A review of multi-sensory technologies in a Science, Technology, Engineering, Arts and Mathematics (STEAM) classroom', *Journal of Learning Design*, 9(2), p. 46. Available at: https://doi.org/10.5204/jld.v9i2.274.

Tegeh, I.M. and Kirna, I.M. (2013) 'Pengembangan Bahan Ajar Metode Penelitian Pendidikan dengan ADDIE Model', *Jurnal IKA*, 11(1), p. 16. Available at: https://ejournal.undiksha.ac.id/index.php/IKA/article/view/1145.

Wahyuni, A. (2020) 'Analisis Kesalahan Siswa dalam Menyelesaikan Soal Aritmatika Sosial', *Jurnal Pendidikan Matematika*, 11(1), p. 67. Available at: https://doi.org/10.36709/jpm.v11i1.10022.

Wahyuni, N., Norawati, S. and Marantika, A. (2024) 'Manajemen Pendidikan Anak Usia Dini (Studi Pada Tk Negeri Pembina Kecamatan Mandau Kabupaten Bengkalis)', *Ranah Research : Journal of Multidisciplinary Research and Development*, 6(1), pp. 124–130. Available at: https://doi.org/10.38035/rrj.v6i1.803.

Walle, J. *et al.* (2018) *Teaching student centered mathematics: Teaching developmentally in grades 6-8*.

Wulandari, R. (2021) 'Talking Stick : a Learning Model To Improve Student' S Mathematics Learning Interest and Achievement in Elementary Schools', *Widyagogik : Jurnal Pendidikan dan Pembelajaran Sekolah Dasar*, 8(2), pp. 70–78. Available at: https://doi.org/10.21107/widyagogik.v8i2.9746.

Yuda, E.K. and Rosmilawati, I. (2024) 'Literasi Numerasi di Sekolah Dasar Berdasarkan Indikator PISA 2023; Systematic Literatur Review', *Journal of Instructional Development Researches*, 4(2), pp. 172–191.