Mathematics Learning Using Japanese Multiplication Method (JAMED) Solving Multiple Problems Class III Basic Education Students

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ABSTRACT

This research examines whether the multiplication abilities of third-grade students in Pamekasan improve before, during, and after using JAMED media for mathematics instruction. The study aims to assess the students' multiplication skills across these three stages, analyzing any observed improvements. The research employs a single subject experimental method with an A-B-A design, using action tests for data collection. The subject is a third-grade student with the initials AW. Findings show that the student's multiplication ability was very low in the initial baseline (A1), improved to a sufficient level during the intervention (B), and reached a high level in the final baseline (A2). This indicates a significant positive impact of JAMED media on the student's multiplication skills.

1. Introduction

One of the K13 translations in mathematics is that students can perform mixed arithmetic operations, one of which is multiplication. The understanding of multiplication is the main mathematical concept that children should learn after they learn addition and subtraction. If the addition and subtraction operations have been introduced in the first grade in elementary school, multiplication operations are usually introduced in the second grade in elementary school. Multiplication is repeated addition. Instilling the concept of multiplication, that is, as in planting the concept of addition and subtraction, planting the concept of multiplication of natural numbers needs to be done by providing students with as many experiences with concrete objects as possible. Activities that use concrete

objects as learning tools should characterize all learning activities. According to the results of the introductory interview on September 19-20 2022 with the homeroom teacher for class III with the initials RA, it was found that one of the students with the initials AW, aged 10 years, was male. in doing multiplication given by the teacher, children can only do basic multiplication even though according to basic competencies children are expected to have mastered multiplication. The multiplication ability of students is only up to the basic multiplication and the media used by the teacher is with media objects around them.

Problems experienced by students require immediate handling/solving because if not addressed then the problem of students' inability in multiplication will continue at the next grade level. Handling students with multiplication counting problems requires learning media that is suitable according to the needs of students, namely by using JAMED media.

The research problem: 1. Can the ability to operate multiplication in class III students in Pamekasan increase before using JAMED media in teaching mathematics? 2. Can the ability to operate multiplication in class III students in Pamekasan increase when JAMED media is used in teaching mathematics? 3. Can the ability to operate multiplication in class III students in Pamekasan increase after using JAMED media in teaching mathematics? 4. Is there a picture of an increase in the ability to operate multiplication using JAMED media seen from results of an analysis between conditions before, during and after being given treatment to class III students in Pamekasan? So that the objectives to be achieved are: 1. How is the multiplication operation ability of class III students in Pamekasan before using JAMED media. 2. How is the ability to operate multiplication in the use of JAMED media in class III students in Pamekasan in teaching mathematics on multiplication material. 3. How is the multiplication operation ability of class III students in Pamekasan increased after using JAMED media. 4. What is the description of the increase in the ability to operate multiplication using JAMED media based on the results of analysis between conditions before, during and after being given treatment to class III students in Pamekasan.

Mathematics has a practical function and can make it easier for children to think as stated by Abdurrahman (Siagian 2017: 61) "Mathematics is a symbolic language whose practical function is to express quantitative and spatial relationships so that its theoretical function is to facilitate thinking". So Mathematics is a science that examines abstract objects arranged using the language of symbols to express quantitative relationships and is useful for solving problems in everyday life. Learning mathematics can also provide reasoning pressure in the application of mathematics. According to Uno (2007: 130) suggests that the purpose of learning mathematics is: Mathematics helps someone so that it is easy to solve problems, because mathematics provides truth based on logical and systematic reasons and can facilitate problem solving because the process of working mathematics is passed sequentially which includes stages observation, guessing, testing hypotheses, looking for analogies, and finally formulating theorems. So that students are able to skillfully use mathematics. In addition, learning mathematics provides reasoning in the application of mathematics. And can provide truth that makes sense and can help children in solving problems.

Multiplication is actually also repeated addition. According to Damayanti (2012: 126) "stated that: Multiplication is the main basic arithmetic operation that children should have learned after they learned the arithmetic operations of addition and subtraction. Therefore, to understand the concept of multiplication, one must first master the concept of addition. The symbol used in multiplication is a cross (x). But in reality students have not been able to do in accordance with the existing curriculum. In this study, the ability to operate multiplication is the score obtained by the test results which show the subject's ability to perform multiplication operations involving natural numbers using JAMED media.

According to Bovee (Asyhar 2011: 4), it is used because of the function of the media as an intermediary or delivery of a message from the sender (sender) to the recipient of the message (receiver). In addition, according to Gagne and Sadiman (Barus 2015: 6), "learning media are various types of components in the student's environment that can stimulate them to learn". That learning media is a tool given by the teacher so that it can be used to attract students' interest and attention in improving their learning outcomes to be more effective.

Japanese Multiplication Methode (JAMED) is a multiplication method created by Professor Fujisawa Rikitarou (1900) from Tokyo University. This method is known in Indonesia as the Cross-Line multiplication method, which is a geometry-based multiplication method with two parallel auxiliary lines, vertical and horizontal (Grain, 2018). For example multiplication 21 x 23, we simply draw 2 lines and space 1 line below with a sufficient distance from the 2 previous lines horizontally. Then draw a vertical line that collides with a horizontal line as many as tens and the units are 2 lines and 3 lines. after that, calculate the point on the bottom right for the unit result. The number of dots in the lower left and upper right to find out the tens results. For hundreds, add up the dots on the top left. And it is true that the result of 21 x 23 = 483 as in figure 1.
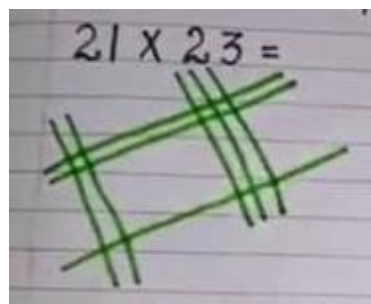
Figure 1. Japanese Multiplication Methode (JAMED)

Strengths and Weaknesses a. Strengths 1. Easy to find answers 2. It only takes a short time 3. No deep knowledge of multiplication is needed 4. Can balance the brain b. Disadvantages 1. It takes a large space to do it.

2. Method

The quantitative approach is a research approach whose specifications are systematic, planned and clearly structured from the outset to the creation of a research design. According to t Sugiyono (2013: 13), "quantitative research methods can be interpreted as research methods based on the philosophy of positivism, used to research on certain populations or samples, sampling techniques are generally carried out randomly, data collection uses research

instruments, data analysis quantitative/statistical in nature with the aim of testing the established hypothesis".

The intended quantitative approach is to determine the increase in the multiplication operations ability of class III students in Pamekasan with before and after the application of Media JAMED.

The research type is a single subject experimental research (single subject research). Sunanto, et al (2005: 41) stated that SSR, or "single subject research," describes study methods that are specifically created to record behavioral changes in single people.

The purpose of the Single Subject Research (SSR) research method is to gather data by examining the effects and efficacy of a treatment in the form of using JAMED media to improve the class III students' ability to operate multiplication before receiving treatment (baseline 1/A1), during treatment (Intervention/B), and after treatment (baseline 2/A2), as well as analysis prior to and following treatment.

Research variable is a basic term in experimental research including single subjects which provides an overview of how this research is carried out. Sunanto (2005: 12) "Variable is an attribute or characteristic about something in the form of objects or events that can be observed". Thus the research variable is everything determined by the researcher to be studied and researched in order to obtain information about it. Based on these problems, this research has one variable that is studied, namely "multiplication operation ability" using JAMED media which is expected to improve students' multiplication operation ability.

This study used an A-B-A design, a three-phase study that aims to assist in overcoming the challenges the subject faces. As stated by Sunanto (2005: 54), the single subject research design that is employed is Withdrawal and Reversal with the Constellation A–B–A. This three-phase research design compares the baseline conditions before and after the intervention in order to determine the extent of the effect that a treatment has on an individual. Three phases comprise Design A – B – A: A1 (baseline 1), B (intervention), and A2 (baseline 2). The following steps will be completed in this study: A1 (baseline 1), which entails determining the multiplication operations ability profile and development of children prior to receiving treatment. Natural therapy is administered to the subjects without any outside intervention. "Prior to any kind of intervention, baseline refers to the situation in which target behavior is measured in its natural state (Sunanto, 2005: 54). The research subjects' state throughout treatment, specifically through the use of JAMED media, is referred to as B (intervention)." Over the course of several sessions, this intervention was repeated. To determine how the intervention affected students' multiplication operation skills, data collection on the subject's ability to do multiplication was done. "When an intervention is provided, the target behavior is measured under these circumstances (Sunanto, 2005: 54). c. A2 (baseline 2), which is the recurrence of baseline conditions to gauge how much the intervention is impacting the person. According to Sugiono (2007), computations known as descriptive statistics are utilized to assess data by characterizing or characterizing the obtained data in its original form.

The A-B-A design has three stages, namely A1 (baseline 1), B (intervention), and A2 (baseline 2). Pictures of the A-B-A design display can be seen in the following figure 2.
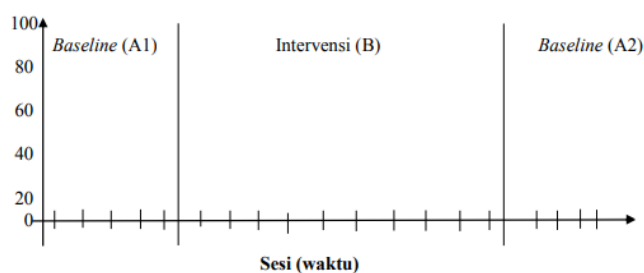
Figure 2. Display graphic design A – B – A

Data Collection Techniques: The form of the test used is a form of action test ordered by the researcher himself and given to a condition (baseline). In this study the measurement of the multiplication operation using JAMED media targets (target behavior) was carried out repeatedly for a certain period of time, namely per day. Comparisons were made on the same subject with different (baseline) conditions. Baseline is a condition where the measurement of target multiplication operations is carried out in natural conditions before intervention is given. Intervention conditions are conditions when an intervention has been given and the target behavior is measured under the conditions.

The instrument used to collect data in this study was an action test in multiplication operations using JAMED media which was compiled based on what was applied in the learning process to determine students' multiplication operations abilities before, during and after being given treatment on JAMED media. The assessment criteria were that students were not able to operate the abacus according to the number of questions given a score of 0, students were able to operate JAMED according to the number of questions given a score of 1. Each wrong answer was given a score of 0 while the correct answer was given a score of 1. It can be written as follows (Arikunto, 2006:19).

$$Result\ value = \frac{Obtained\ score}{maximal\ score} \times 100 \tag{1}$$

The result value of multiplication operations using JAMED media is calculated in the following categories.

Table 1. Multiplication Operation Ability Category

No	Inteval	Category
1	80-100	Very High
2	66-79	High
3	55-65	Enough
4	41-45	Low
5	<41	Very Low

(Arikunto, 2006:19)

Scores and percentages will be applied to the testing results from each phase, which are baseline-1 (A1), baseline-2 (A2), and intervention. According to Sunanto(2005) " By multiplying the total likelihood of an event by 100%, the percentage indicates the frequency of a behavior or event".

Percentages (%) are used in calculations while handling data. Sunanto (2006) explains that "the percentage indicates the number of occurrences of a behavior or event compared to the overall likelihood of the occurrence of the event

multiplied by 100%". The researcher will compute the score of the student's ability in the Multiplication Operation before and after receiving the treatment (intervention), which is why percentages are used. The right answer for each student was divided by the overall score, then multiplied by 100.

3. Results and Discussion

Data interpretation under the following circumstances: baseline 1 (A1), baseline 2 (A2), and intervention (B). the multiplication operation ability of class III students at SDN Pamekasan was combined into one or entered in a format, the results can be seen as follows:

Table 2. Data Multiplication ability results Baseline 1 (A1), Intervention (B) and Baseline 2 (A2)

Sesion	Maximun Score	Score	Mark
Baseline **1 (A1)**			
1	10	3	30
2	10	3	30
3	10	3	30
4	10	3	30
5	10	3	30
Intervence **(B)**			
6	10	5	50
7	10	5	50
8	10	6	60
9	10	6	60
10	10	6	60
11	10	6	60
12	10	6	60
13	10	7	70
14	10	7	70
15	10	8	80
Baseline **2 (A2)**			
16	10	7	70
17	10	7	70
18	10	8	80
19	10	8	80
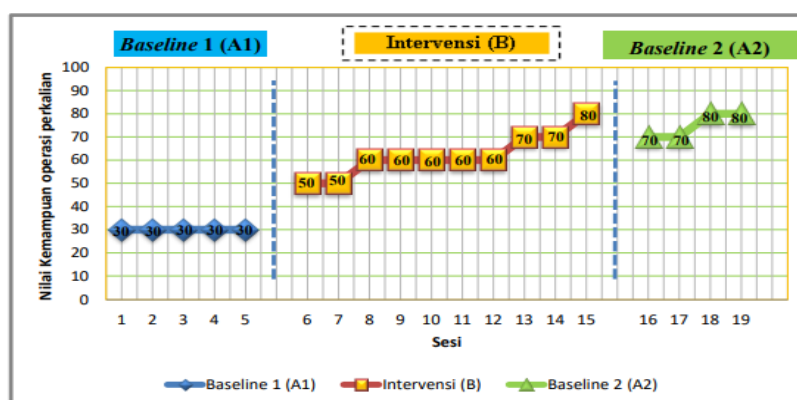
Figure 1. Multiplication Operation Ability of Class III Children at SDN Pamekasan in Baseline 1 (A1), Intervention (B) and Baseline 2 (A2) Conditions
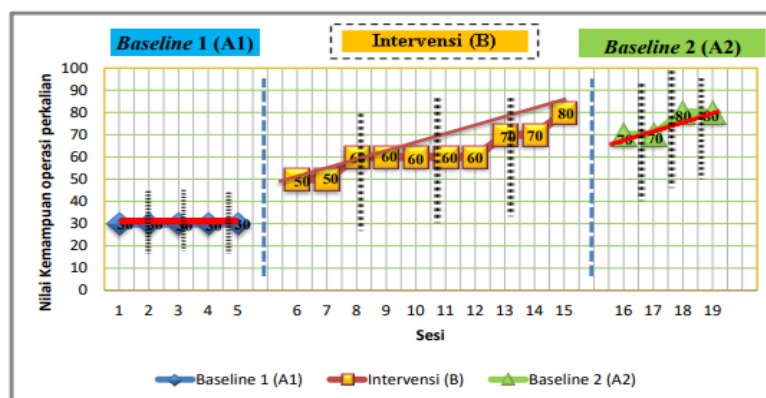
Figure 2. Trends in the Direction of Multiplication Operation Capability in Baseline 1 (A1), Intervention, and Baseline 2 (A2) Conditions

Table 3. Results of Visual Analysis in the Multiplication Operation Capability Condition Baseline 1 (A1), Intervention (B) and Baseline 2 (A2) Multiplication Operation Capability.

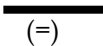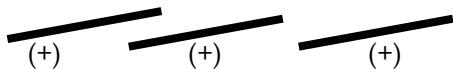| Condition	A1	B	A2
Condition-Length	5	10	4
Directional Trend Estimate	(=)	(+)	(+)
Stability Trends	Stable	Variable	Stable
	100%	50%	100%
Data Trace	(=)	(+)	(+)
Stability Level and Range	Stable	Variable	Stable
	30 - 30	50 - 80	70 – 80
Level change	Stable	Variable	Stable
	(0)	(+30)	(+10)

Explanation of the table of visual analysis results in the following conditions:

a) Baseline 1 (A1) conditions had five sessions per condition, Intervention conditions (B) had ten sessions, and Baseline 2 (A2) conditions had four sessions.

b) The data on the subject's capacity to operate the AW from the first to the fifth session has the same value, 30, as indicated by the lines in the above table, indicating that the tendency in the Baseline 1 condition (A1) is to be flat. The data on the subjects' capacity to operate multiplication from the sixth to the fifteenth session rose in value, as indicated by the trend of the line in the Intervention condition (B). However, in baseline condition 2 (A2), the direction tends to grow, indicating an improvement or increase in the AW subjects' multiplication operation ability from session sixteen to session nineteen (+).

c) The data collected indicates stability as the tendency for stability in Baseline 1 (A1) settings was calculated and the findings were 100%. The data acquired is unstable (variable) since the Intervention condition (B) has a 50% inclination toward stability. Baseline 2 (A2) has a 100% trend of stability, indicating that the data is stable.

d) The data trail's explanation matches the preceding trend direction (point b). Conditions at baseline 1 (A1), baseline 2 (A2), and intervention (B) ultimately increased.

e) Under Baseline 1 (A1) settings, data tends to be flat with a range of 30 to 30, under Intervention conditions (B) data tends to increase with a range of 50 to 80, and under Baseline 2 (A2) conditions data tends to increase or increased (+) stably with a range of 70 to 80.

f) The data, specifically (=) 30, remained unchanged after the explanation of the level change in Baseline 1 (A1). A change in level, namely an increase of (+) 30 was seen in the Intervention condition (B). Meanwhile, there was a change in Baseline 2 (A2), with the level now being (+) 10.

The components of the analysis between conditions can be seen in the following table.

Table 4. Results of Analysis between Multiplication Operation Capability Conditions

Comparison of Conditions	A1/B	B/A2
Number of variables	1	1
Changes in trend direction and their effects	(=) (+)	(+) (+)
	Positive	Positive
Changes in Stability Trends	Stable to Variable	Variable to Stable
Level change	(30 - 50)	(80 - 70)
	(+20)	(-10)
Percentage of Overlap	0%	0%

The following provides an explanation of the visual analysis results between conditions:

a) One variable, from Baseline 1 condition (A1) to Intervention (B) and from Intervention condition (B) to Baseline 2 (A2), is the only one that has changed.

b) The trend direction between the Intervention circumstances (B) and Baseline 1 conditions (A1) shifts from flat to rising. This suggests that following the Intervention (B), things may improve or turn out better. There is a tendency for the Intervention condition (B) with Baseline 2 (A) to increase steadily.

c) Variations in the stable to variable trend between Baseline 1 (A1) and Intervention (B) conditions. On the other hand, the variable became steady in the Baseline 2 (A2) to Intervention condition (B). This occurred as a result of the AR subjects' multiplication operation abilities receiving different values in the Intervention condition (B).

d) There was a (+) 20 improvement or increase in level between Baseline 1 (A1) and Intervention (B) conditions. Conversely, there was a drop or modification in level (-) of 10 between Baseline 2 (A2) and Intervention conditions (B).

e) Data overlap is 0% between Baseline 1 (A1) and Intervention (B) conditions and 0% between Baseline 2 (A2) and Intervention conditions (B). The results of the growth in the graph show that giving Intervention (B) still has an impact on the target behavior, which is the capacity to perform multiplication. Accordingly, Intervention (B) will have a greater impact on the target behavior (target behavior) the lower the percentage of overlap.

Multiplication Operations Ability is a part that should have been mastered by every grade III student. However, based on the initial assessment carried out, it was found that third grade students in Pamekasan experienced multiplication problems where students were only able to do basic multiplication. This condition is found in the field so that researchers take this problem. This study uses JAMED media as a way to have a positive influence in improving students' multiplication operations skills, because students are more interested in visual media that has colors that are attractive to students. Therefore, the use of media in the learning process is very important because the presence of media can enhance and support student success in learning. Can provide a concrete understanding of the material provided and the use of JAMED media in learning mathematics multiplication operations. For this reason, the intervention in this study was carried out through JAMED media with modified steps adapted to the characteristics of the AW subject.

This research was conducted while it was divided into three conditions, namely Baseline 1 (A1), Intervention (B), and Baseline 2 (A2). This was indicated by a significant increase in the ability to operate multiplication before and after the treatment, as seen from Baseline 1 (A1) the data obtained was stable, so the researcher stopped giving the test.

In the Intervention (B) the researcher gave the treatment, the multiplication operation ability of the AW subject in the Intervention condition (B) increased. This can happen because JAMED media is given, so that the multiplication operation ability of the AW subject has increased. Whereas at baseline A2 (after being given treatment) the scores obtained by students appeared to decrease and finally the scores obtained by students experienced an increase, when compared to baseline 1 (A1) the value of the multiplication operation ability test. Some of the research results that are relevant to this research are research conducted by Grain (2018) using JAMED to improve students' multiplication arithmetic operations. Nur Hidayah's research shows the effect of using the JAMED formula in class III SD which shows progress towards understanding multiplication in class III SD. And also based on similar research by Zharfa Nur fajrina in 2018 it resulted that using this formula can help develop students' mathematical representation abilities. So that a JAMED method is produced as a solution in learning multiplication of mathematics.

Based on the results of the analysis of data processing that has been carried out and presented in the form of line graphs, using the A-B-A design for the target behavior can improve the multiplication operations ability, the abacus media has a positive effect on increasing multiplication operations on students. Thus it can answer the formulation of the problem in this study, namely that the use of JAMED media can improve the multiplication operations ability of class III students in Pamekasan.

4. Conclusions

Based on the results of the research and data analysis, it was concluded that: 1. The ability to operate multiplication in class III students in Pamekasan before being given the intervention (baseline 1/A1) obtained the same value and was included in the very low category. 2. The multiplication operation ability of class III students in Pamekasan when the intervention (B) was carried out through the abacus media was unstable or variable. There was an increase in the level change

due to the influence of JAMED media and it was included in the sufficient category. 3. The multiplication operation ability of grade III students in Pamekasan after being given intervention through JAMED media in condition (Baseline 2/A2) has increased compared to baseline condition 1 (A1), obtained a stable value and is included in the high category. 4. The ability to operate multiplication in class III students in Pamekasan is based on the results of an analysis between conditions, namely before being given an intervention (Baseline 1 (A1) the ability to operate multiplication in students is very low, increasing to the sufficient category in conditions when given intervention (B), and from conditions when given the Baseline 2 (A2) intervention increased to the high category.Based on these data, it can be concluded that the use of abacus media can improve the ability to operate multiplication in class III students in Pamekasan.

Author Contributions
The model was constructed with assistance from the first and second authors. The theoretical analysis and result interpretation were assisted by the first and third authors. The analysis and numerical simulations were assisted by the fourth and fifth authors. The manuscript was amended by the corresponding author, the first author, based on feedback from journal editors and reviewers. Each author offered insightful criticism and contributed to the development of the study, analysis, and manuscript.

Declaration of Competing Interest
No potential conflict of interest was reported by the author(s).

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