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The Japanese Line Method as a Tool for Multiplication Mastery: A Quasi-Experimental Study in a Philippine Elementary Context

Rocelyn Legaspi[1]*, Kimberly Cayano[2], Reynald Maliao[3], Jeffry Jerome Beñola[4], Ma. Mikaela Gador[5], and **Sydney Jay Villarin[6]**
[1]–[6] Initao College, Initao, Misamis Oriental, Philippines

[1] https://orcid.org/0009-0006-4451-5382 [2] https://orcid.org/0009-0005-6016-794X
[3] https://orcid.org/0009-0004-1726-910X [4] https://orcid.org/0009-0007-2620-1790
[5] https://orcid.org/0009-0009-3050-545X [6] https://orcid.org/0009-0006-1346-0681

* Corresponding Author: legaspirocelyn1@gmail.com

Abstract. This mixed-methods quasi-experimental study examined the effectiveness of the Japanese Line Method (JLM) for multiplication in enhancing the mathematical skills of Grade 3 elementary pupils, emphasizing hands-on learning experiences and visual strategies. A total of 22 Grade 3 pupils from Kamelon Elementary School participated. To evaluate the method's effectiveness, the researchers conducted pretests and posttests and analyzed the scores using statistical tools, including the Wilcoxon signed-rank test to assess differences. In addition to the quantitative data, the study employed a thematic approach to analyze pupils' reflections and experiences after the intervention, providing deeper insights into their engagement and perceptions of JLM. The findings showed significant improvements in the multiplication skills of the pupils who used JLM, indicating its effectiveness as a teaching strategy. This study emphasizes the advantages of using JLM in mathematics education and suggests it can be a valuable tool for enhancing students' multiplication skills and improving their overall mathematical learning experience, particularly in the context of the Department of Education's learning competencies. Moreover, the positive results highlight the importance of integrating visual and tactile methods in teaching mathematics to cater to diverse learning styles. Teachers are encouraged to integrate JLM into regular mathematics instruction to support learners who benefit from visual and hands-on strategies. Schools may also consider providing training and workshops to help educators implement this method effectively and further enhance pupils' understanding of multiplication.

Keywords: *Japanese Line Method; Multiplying of Quantities; Multiplication skills, Quasi-Experimental Design, Visual Learning Strategy.*

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Introduction

Difficulties in learning basic arithmetic continue to affect many elementary learners, particularly in mastering multiplication, a fundamental skill for higher mathematical learning. Early-grade learners often struggle because of limited conceptual understanding, reliance on rote memorization, traditional teaching strategies, and differences in cognitive development. According to Azizzah et al. (2022), many students face difficulties because instructional approaches are often repetitive rather than meaningfully engaging. These persistent challenges highlight the need for alternative strategies that promote deeper comprehension. Furthermore, Jamaludin & Maat (2020) argued that alternative methods for learning multiplication in the Mathematics syllabus can help teachers diversify their teaching and learning methods. In this study, the Japanese line method is an alternative approach that is used to solve multiplication problems.

While various instructional innovations exist, visual and hands-on approaches help bridge gaps in conceptual understanding. According to Garain and Kumar (2018), the Japanese multiplication, or Japanese Line method, is a geometry-based multiplication method created by Professor Rikitaro in 1900. One emerging visual technique is the Japanese Line Method, a strategy that turns multiplication into a concrete, visual process through line drawing and counting intersections. Thangaraj and Chin (2024) explained that this method encourages engagement by shifting from memorization to visualization, making the procedure accessible even to learners who struggle with traditional algorithmic approaches. The Japanese Line Method offers an innovative, learner-centered approach to multiplication that aligns well with contemporary educational practices promoting conceptual learning, visual engagement, and skill mastery (Flores & Hinton, 2019; Mills, 2019). This echoes Piaget's Cognitive Theory, which emphasizes that children in the concrete operational stage learn best through visual and experiential activities that help them construct understanding from tangible experiences. As cited by Dumagat et al. (2024), this method helps learners make abstract mathematical concepts more concrete and meaningful. According to Alabi (2024), visual learning is a learning style that emphasizes images, diagrams, charts, and other visual aids to enhance comprehension and retention. In this study, the researchers integrate the intersection of lines to improve answer accuracy when solving multiplication problems. Vale and Barbosa (2023) argued that active learning rooted in cognitive, social, and physical engagement supports collaborative problem-solving and reflection, allowing students to solve problems, identify patterns, and develop greater metacognitive awareness.

Supporting this view, Alomiear et al. (2024) found that cognitive practices boost students' mathematical literacy by stimulating cognitive engagement and reflection throughout the learning process. Moreover, collaborative learning is a powerful educational approach that fosters student engagement and deeper understanding by encouraging learners to work together to solve problems and explore concepts. According to Merrotsy (2023), collaborative mathematical inquiry promotes curiosity, critical thinking, and the shared construction of knowledge among learners. In this study, the researcher and learners actively collaborate to master the Japanese Line Method for solving multiplication problems, engaging in shared problem-solving and mutual support throughout the learning process.

Although international studies have shown its effectiveness, recent Philippine studies have also demonstrated the potential of the Japanese Line Method to improve learners' multiplication skills. Prior studies in Nigeria, Malaysia, and Indonesia reported significant improvements in students' academic performance, retention, mathematical fluency, and problem-solving skills when students were exposed to the method (Abari & Tyovenda, 2022; Aliyu, 2022; Nuritasari et al., 2024). Similarly, Dumagat et al. (2024) found that Grade 3 learners taught using the Japanese Line Method achieved

significantly higher multiplication performance than those taught through traditional approaches. Despite these promising findings, existing Philippine evidence remains limited in scope and concentrated in a small number of educational settings, indicating the need for further contextual validation among diverse groups of Filipino learners. As Dumagat et al. (2024) emphasize, integration of the method in Philippine schools is minimal. The Department of Education's teaching frameworks and teacher training programs have not widely implemented it. This presents a compelling need to validate its potential within local learning environments.

To address this gap, the present study aims to determine the effectiveness of the Japanese Line Method in enhancing the multiplication skills of 22 Grade 3 learners enrolled at Kamelon Elementary School, using pretest and posttest results supported by learners' qualitative reflections and perceptions. The participants were selected to represent primary-level learners developing foundational multiplication skills, making them an appropriate group for examining the effectiveness of the Japanese Line Method in the local elementary school context. The findings intend to provide evidence-based insights that may support instructional improvement, curriculum enhancement, and teacher training in primary mathematics education. By offering a visual, active, and learner-centered approach, this study aspires to contribute to more meaningful mathematical learning experiences that may strengthen both skill mastery and learner engagement.

Specifically, this study sought to determine the effectiveness of the Japanese Line Method in enhancing the multiplication skills of Grade 3 learners at Kamelon Elementary School. It examined learners' multiplication skills before and after implementing the Japanese Line Method, determined whether a significant difference existed between their pretest and posttest performance, and explored learners' perceptions of the Japanese Line Method as a learning strategy for multiplication.

Based on the foregoing discussion, the study is guided by the following hypotheses:

> H_0: There is no significant difference in the multiplication skills of Grade 3 pupils before and after using the Japanese Line Method.
>
> H_1: There is a significant difference in the multiplication skills of Grade 3 pupils before and after using the Japanese Line Method.

Methodology

This study used a mixed-methods quasi-experimental research design with a cluster group pretest–posttest approach and a thematic qualitative component. A quasi-experimental design was appropriate because the research was conducted in a natural classroom environment where random assignment and a control group were not feasible. A total of 22 Grade 3 pupils from Kamelon Elementary School participated in both the pretest and posttest after receiving an instructional intervention using the Japanese Line Method. The study recorded time spent answering, response accuracy, and students' observable problem-solving strategies. The researchers conducted a thematic analysis after the intervention to capture learners' experiences and perceptions of the method.

The participants consisted of 22 Grade 3 pupils enrolled at Kamelon Elementary School. The researchers used cluster sampling to select the intact class section. All pupils took part in the pretest to determine their baseline multiplication skills. The researchers then administered the instructional intervention using the Japanese Line Method, followed by a posttest to measure improvement. Participation was voluntary, and no student was excluded unless a parent or guardian declined consent.

A researcher-developed 15-item multiple-choice test served as the primary assessment instrument. The test contained multiplication items involving one-digit × one-digit and two-digit × one-digit operations appropriate for Grade 3 learners. The researcher administered the same instrument before and after the intervention to determine changes in multiplication performance. The researcher also collected qualitative data through short guided reflection prompts and semi-structured interviews after the posttest.

The researcher-made 15-item multiple-choice test underwent face and content validation by two Mathematics experts from the Teacher Education Department to ensure clarity, appropriateness, and alignment with Grade 3 learning competencies. The researchers incorporated suggestions on item difficulty, structure, and wording before administering the tool. A significant limitation of this study is the absence of formal pilot testing (e.g., Cronbach's alpha) for the assessment instrument, which should be considered when interpreting the results. The researchers did not conduct reliability testing through pilot administration and statistical computation due to time and contextual limitations; however, expert review and revisions aimed to ensure the assessment items' clarity and relevance.

Before data collection, the Research Adviser endorsed an approval letter, and the Dean of the Teacher Education Program authorized it. The researchers obtained permission from the school principal and the Grade 3 class adviser. The researchers ensured ethical compliance through informed consent signed by parents or guardians, and they also sought assent from learners. All protocols adhered to Republic Act No. 10173 (Data Privacy Act of 2012). The study observed confidentiality, voluntary participation, and anonymity throughout.

The researchers first administered the pretest to determine the learners' initial multiplication competency. The researchers then taught the Japanese Line Method through guided practice and supervised activities over a scheduled instructional period. After the intervention, the researchers administered the posttest using the same validated assessment tool. The researchers checked, recorded, and statistically analyzed all test papers. The researchers collected qualitative responses through reflection prompts and semi-structured interviews to identify learning experiences, engagement, and perceived benefits or challenges.

The learners' pretest and posttest scores were analyzed using descriptive and inferential statistics. Mean and percentage scores were computed to describe performance levels before and after the intervention based on the following interpretation scale:

Mean Score	Interpretation	Percentage
14–15	Excellent	95–100%
12–13	Good	90–94%
10–11	Average	80–89%
8–9	Poor	75–79%
7 and below	Did not meet expectations	Below 75%

A paired-sample t-test was used to determine whether a statistically significant difference existed between pretest and posttest results. Qualitative data were analyzed using thematic analysis following Creswell's (2007) simplified version of Moustakas's (1994) Stevick-Colaizzi-Keen process, which involves identifying significant statements, coding and clustering these statements into themes, and developing descriptions that capture the essence of the participants' experiences. This approach identified common patterns, insights, and perceptions about using the Japanese Line Method to learn multiplication.

Results

The results are presented according to the research questions. Data were obtained from the pre-test, post-test, and learners' perception responses.

Table 1
Level of Multiplication Skills of Grade 3 Pupils Before Using the Japanese Line Method

Variable	N	Minimum	Maximum	Mean	SD	Remarks
Pre-test	22	0	14	7.95	3.68	***Failed to meet the expectation***

Legend: Excellent (14–15 or 95%–100%), Good (12–13 or 90%–94%), Average (10–11 or 80%–89%), Poor (8–9 or 75%–79%), Failed to meet the expectation (7 and below or ≤ 75%)

Before exposure to the Japanese Line Method, pupils' scores ranged from 0 to 14, with a mean score of 7.95 and a standard deviation of 3.68. The overall descriptive rating reflected that the pupils failed to meet the expected proficiency in multiplication. The results indicated that most learners could not successfully perform 1-digit by 1-digit and 2-digit by 1-digit multiplication operations before the intervention. The low mean score suggested limited mastery, while the wide score range reflected varied skill levels among pupils.

Table 2
Level of Multiplication Skills After Using the Japanese Line Method

Variable	N	Minimum	Maximum	Mean	SD	Remarks
Post-test	22	4	15	12.05	3.32	***Good***

Legend: Excellent (14–15 or 95%–100%), Good (12–13 or 90%–94%), Average (10–11 or 80%–89%), Poor (8–9 or 75%–79%), Failed to meet the expectation (7 and below or ≤ 75%)

After using the Japanese Line Method, pupils obtained scores ranging from 4 to 15, with a recorded mean score of 12.05 and a standard deviation of 3.32. The "Good" classification reflected improved multiplication skills. The rise in the mean score from pre-test to post-test signified a notable improvement in pupils' multiplication skills. The increase also suggested that most learners understood and could apply the concepts taught through the Japanese Line Method.

Table 3
Difference in Multiplication Skills Before and After Using the Japanese Line Method

Variable	n	Mean	SD	Mean Difference	W	*P*-value	Remarks
Pre-test	22	7.95	3.68	-4.00	0.902	< 0.001	***Significant***
Post-test	22	12.05	3.32				

Note: Results are considered statistically significant at a p-value of ≤ 0.05.

The mean difference between pre-test and post-test scores was -4.00. The Wilcoxon Signed-Rank Test yielded W = 0.902 and p-value < 0.001, which indicated a statistically significant difference. Because the p-value was below the 0.05 significance level, the study rejected the null hypothesis. This confirmed a significant improvement in multiplication skills after implementing the Japanese Line Method.

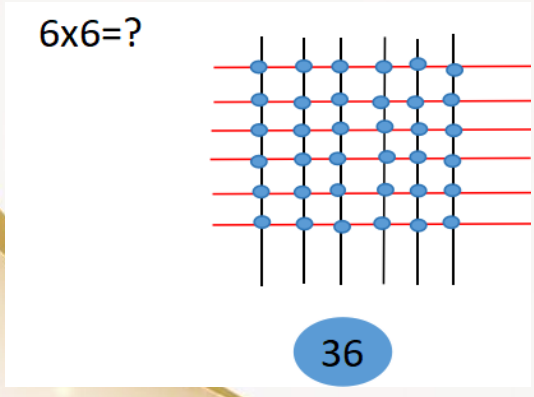
Table 4

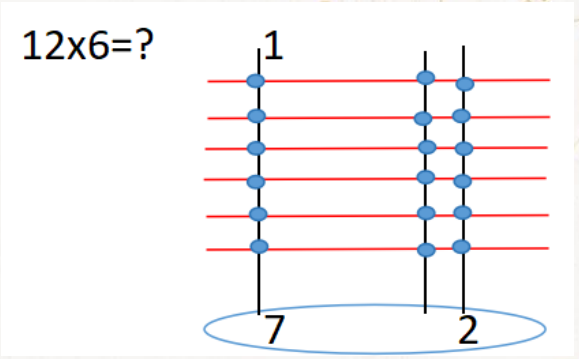
Thematic Analysis of Learners' Perceptions of the Japanese Line Method

Main Themes	Sub themes	Significant Statements	General Description of the Theme
Positive Emotional Responses	Confidence and Enjoyment	*"It helped me to get a high score and it makes me smart." – Student 6* *"It is amazing to use and it is easy for my brain." – Student 4*	Learners expressed joy, confidence, and emotional satisfaction with the method, showing a positive mindset toward math.
Impact on Learning	Improved Accuracy and Speed	*"The method helped me a lot because it makes me solve faster and my score improved." – Student 1* *"It really helped me a lot and makes me faster in solving multiplication." – Student 9*	The method enhanced learners' performance, especially in terms of solving multiplication problems more efficiently.
	Conceptual Understanding	*"Yes, it did help me understand how multiplication works." – Student 2* *"Yes, the Japanese Line Method helped me understand how to multiply." – Student 5*	Learners developed a better understanding of the multiplication process, not just the correct answers.
Engagement and Inclusivity	Ease of Use and Accessibility	*"I just draw stick-stick and count them." – Student 4* *"I didn't get confused because it's easy to use." – Student 7*	The method was perceived as engaging and inclusive due to its simplicity and visual nature, even for struggling learners.
	Overcoming Initial Confusion	*"I got confused at first but I understand it later on." – Student 3*	Some learners faced initial challenges but were able to grasp the method, showing its learnability and accessibility.
Motivation and Achievement	Desire to Perform Well	*"It helped me to get a high score." – Student 6* *"I managed to solve multiplication fast." – Student 7*	The method contributed to learners' motivation by helping them achieve better results and feel successful in math.
Adaptability and Ease of Learning	Quick Learning and Retention	*"I didn't get confused." – Students 1, 2, 5, 6, 7, 8, 10* *"I didn't have hard time in using the Japanese Line Method." – Student 10*	Learners found the method easy to learn, even without extended practice, demonstrating its adaptability and clarity.

Five major themes emerged based on learners' responses: positive emotional responses, impact on learning, engagement and inclusivity, motivation and achievement, and adaptability and ease of learning. The responses indicated that pupils perceived the Japanese Line Method positively, emphasizing enjoyment, confidence, ease of learning, and improved academic performance. These perceptions supported the quantitative results showing improved multiplication skills.

Visual Materials





Discussion

The pre-test results showed that Grade 3 pupils had below-expected proficiency in multiplication before the intervention, with a mean score of 7.95 interpreted as “Failed to meet the expectation.” This indicates that learners lacked the foundational understanding needed to solve 1-digit × 1-digit and 2-digit × 1-digit multiplication problems effectively.

This finding suggests substantial gaps in both conceptual and procedural knowledge, which may stem from limited exposure to strategies that visually represent multiplication. The wide variability in scores further highlights uneven skill distribution within the group, suggesting that traditional methods may not have adequately supported diverse learners.

These findings support Azzizah et al. (2022), who noted that many elementary pupils struggle with multiplication because of difficulties with abstraction and insufficient engagement. The low pre-test performance clearly shows the need for alternative pedagogical approaches that promote deeper understanding and accommodate varied learning styles.

Post-test results showed a substantial improvement, with the mean score rising to 12.05, categorized as “Good.” This shows that learners understood the Japanese Line Method and could apply it effectively to solve multiplication items.

The improvement suggests that the method’s visual, structured nature helps learners understand and apply multiplication procedures more effectively by turning numerical processes into concrete, easy-to-follow steps. This aligns with research by Abari and Tyovenda (2022), who found that the Japanese Line Method significantly enhanced students’ mathematical achievement through visual representation and structured problem-solving.

Thus, the data suggest that this method supports learners’ understanding of multiplication by providing a clear mental model of multiplication operations. These results reflect performance immediately following the intervention. Because the study did not include delayed post-testing, these findings reflect short-term post-intervention performance rather than verified long-term retention.

The Wilcoxon Signed-Rank Test yielded a p-value < 0.001, confirming a statistically significant improvement. This aligns with findings from international contexts and studies within the Philippine curriculum.

The findings are particularly relevant to the Department of Education’s Grade 3 Mathematical learning competencies, which require learners to demonstrate understanding and fluency in basic multiplication operations. The JLM may serve as a supplementary instructional strategy to help learners achieve these competencies through visual and hands-on learning experiences.

The 4-point increase in mean scores highlights the method’s effectiveness in bridging conceptual gaps and strengthening pupils’ understanding of multiplication processes. This aligns with Dumagat et al.(2024), who reported similar improvements in understanding and multiplication performance among Filipino Grade 3 learners after using the method. According to Zhang et al. (2016), students employ diverse strategies when solving multiplication problems, and their choice of strategy affects accuracy and efficiency. This highlights the importance of comparing teaching approaches, such as the traditional method and the Japanese Line Method, to determine which best supports student learning.

These findings further affirm those of Nuritasari et al. (2024) and Aliyu (2022), whose research demonstrated the method's effectiveness in diverse international contexts. Taken together, the evidence supports the method's potential as a powerful intervention for improving and sustaining mathematical skills. Aktay and Yılmaz (2025) found that teaching multiplication through the Japanese Multiplication Method enhances students' understanding, engagement, and problem-solving skills, and that students improved not only in computation accuracy but also in their conceptual grasp of multiplication patterns compared to traditional methods.

Qualitative analysis of participants' written responses to the open-ended questions administered after the posttest revealed highly positive perceptions of the Japanese Line Method. The responses were collected and analyzed using thematic analysis, resulting in five major themes: Positive Emotional Responses, Impact on Learning, Engagement and Inclusivity, Motivation and Achievement, and Adaptability and Ease of Learning.

The following sections present and interpret each main theme identified from the learners' responses.

4.1 Positive Emotional Response

One of the most prominent themes that emerged from the learners' responses was their positive emotional reaction toward the Japanese Line Method. Many learners expressed confidence, joy, and satisfaction in using the strategy. For instance, one student said, "It helped me to get a high score, and it makes me smart," while another remarked, "It is amazing to use, and it is easy for my brain." These responses suggest that the method not only facilitated learning but also boosted self-esteem and generated a sense of accomplishment. This positive emotional response matters because it makes learning more enjoyable and encourages continued engagement in mathematics.

This observation aligns with the findings of Kareem et al.(2022), who reported that the Japanese Multiplication Method increased students' interest and enjoyment in learning math. Similarly, Aliyu (2022) found that learners exposed to this method demonstrated heightened enthusiasm and confidence when solving multiplication problems. The method's visual and interactive nature plays a crucial role in creating a positive emotional environment, supporting the idea that emotional engagement can enhance cognitive performance (Lasmawan & Budiarta, 2020). Such emotional upliftment not only enhances immediate participation but may also lead to sustained motivation and improved long-term academic outcomes.

4.1.1 Confidence and Enjoyment

Learners showed clear confidence and enjoyment when using the Japanese Line Method. Many expressed that the method made them feel "smart" and successful in solving multiplication problems. For instance, one student shared, "It helped me to get a high score, and it makes me smart," while another mentioned, "It is amazing to use, and it is easy for my brain." These responses show how the method fostered a positive emotional experience and supported the development of self-belief in their mathematical abilities.

This indicates that the Japanese Line Method not only improves mathematical performance but also supports learners' emotional engagement, which is crucial for developing long-term interest in the subject. Positive emotions in learning often increase motivation and participation in academic tasks (Sunzuma & Luneta, 2023).

4.2 Impact on Learning

Learners also reported that the Japanese Line Method clearly affected their academic performance, particularly in speed and accuracy. Statements such as "The method helped me a lot because it makes me solve faster and my score improved" and "It really helped me a lot and makes me faster in solving multiplication" demonstrate that the method helped learners become more efficient problem-solvers. In addition to computational fluency, some learners indicated improved conceptual understanding, stating that the method helped them understand how multiplication works. This indicates that the strategy supports both procedural and conceptual learning in mathematics.

These learner experiences align with Thangaraj and Chin (2024), who concluded that the Japanese Multiplication Method significantly improved computation fluency and speed among primary students. Similarly, Abari and Tyovenda (2022) emphasized the method's effectiveness in enhancing not only students' performance but also their retention of mathematical concepts. Furthermore, Nuritasari et al. (2024) highlighted that the method supports both procedural competence and conceptual clarity, reinforcing the idea that visual strategies can aid deeper understanding of mathematical operations. These studies confirm that the Japanese Line Method positively influences learning outcomes by fostering accuracy, speed, and conceptual insight.

4.2.1 Improved Accuracy and Speed

Several learners reported that the method helped them solve problems faster and more accurately. Student 1 stated, "The method helped me a lot because it makes me solve faster and my score improved," while Student 9 shared, "It really helped me a lot and makes me faster in solving multiplication." These responses show how the visual and structured nature of the Japanese Line Method supports procedural fluency in solving multiplication problems.

The increase in speed and accuracy suggests that the method effectively strengthens computational skills, allowing learners to gain confidence through performance. This finding is supported by Thangaraj and Chin (2024), who noted significant improvements in students' multiplication fluency using the Japanese method.

4.2.2 Conceptual Understanding

Beyond speed, some learners expressed that the method helped them better understand multiplication itself. Student 2 shared, "Yes, it did help me understand how multiplication works," and Student 5 added, "Yes, the Japanese Line Method helped me understand how to multiply." These insights highlight the method's ability to make abstract multiplication concepts more concrete through visualization.

This aligns with Piaget's constructivist theory, which emphasizes hands-on learning and concrete experiences in building deeper understanding (Lasmawan & Budiarta, 2020).

4.3 Engagement and Inclusivity

Another key theme was the method's ability to engage learners and accommodate different learning needs. The simplicity and visual nature of the Japanese Line Method made it accessible, even to those who may struggle with traditional strategies. One student described the process as "stick-stick and count them," highlighting how easily the method could be followed. While a few learners initially felt confused, such as one who said, "I got confused at first, but I understand it later on," most found the method

easy to use and inclusive, suggesting it can be effectively applied in diverse classrooms.

This observation aligns with the findings of Dumagat et al. (2024), who emphasized the suitability of the Japanese Line Method within the Philippine elementary curriculum, particularly for mixed-ability learners. Their study showed that the method's visual and kinesthetic nature helped bridge gaps in mathematical understanding. Similarly, Nuritasari et al. (2024) highlighted how the Japanese Line Method supported students with various learning difficulties, allowing them to grasp multiplication concepts more confidently. These findings underscore the method's potential to promote inclusive learning environments and foster equal participation in mathematics instruction.

4.3.1 Ease of Use and Accessibility

The method's simplicity and clarity made it easy for students to use and understand. Student 4 mentioned, "I just draw stick-stick and count them," while others like Student 7 said, "I did not get confused because it is easy to use." These responses show that the method is accessible to a wide range of learners, including those who may struggle with traditional methods.

This inclusivity is important in a diverse classroom where learners have different levels of understanding. According to Dumagat et al. (2024), the Japanese Line Method provides an alternative approach that caters to varied learning styles in Philippine classrooms.

4.3.2 Overcoming Initial Confusion

While most learners found the method easy to use, some initially experienced confusion. Student 3 shared, "I got confused at first, but I understood it later on." This suggests that while the method may require brief adjustment, it is highly learnable.

This supports the idea that learners, even those who initially struggle, can adapt quickly with guidance, consistent with Vygotsky's Zone of Proximal Development, where learning occurs best with appropriate support (Lasmawan & Budiarta, 2020).

4.4 Motivation and Achievement

The Japanese Line Method also contributed to increased motivation and a sense of achievement among learners. Several students linked their use of the method to improved performance and personal success, saying things like "I managed to solve multiplication fast" and "It helped me to get a high score." These statements reflect how the method positively influenced students' attitudes and aspirations, motivating them to engage more confidently with multiplication tasks.

This aligns with Kareem et al. (2022), who noted that learners exposed to the Japanese Multiplication Technique showed higher interest and enthusiasm for mathematics. Their study reported a significant boost in learners' intrinsic motivation, especially as they began to see tangible improvements in their academic results. Likewise, Aliyu (2022) observed that the strategy's structured yet engaging format encouraged active participation and perseverance, which in turn led to higher academic achievement among primary school pupils. These studies reinforce the notion that learner motivation and achievement are strongly influenced by instructional strategies that are both accessible and effective.

4.4.1 Desire to Perform Well

Many learners connected their use of the Japanese Line Method with improved results

and performance. Statements like “It helped me to get a high score” and “I managed to solve multiplication fast” show that the method not only supports skill development but also motivates learners to perform better. When students see tangible academic improvement, their intrinsic motivation increases, leading to a positive learning cycle. This finding aligns with Kareem et al. (2022), who observed that the method enhanced pupils' interest and motivation in mathematics.

4.5 Adaptability and Ease of Learning

Finally, learners overwhelmingly described the method as easy to learn and apply, with multiple students stating, "I did not get confused" or "I did not have a hard time using it." This theme reflects the Japanese Line Method's adaptability, making it effective even for young learners with varied skill levels. Its straightforward, visual format seems to support quick understanding and retention, which are especially beneficial in foundational math instruction.

This observation is supported by Dumagat et al.(2024), who emphasized that the Japanese Line Method is notably accessible to learners across varying levels of mathematical competence. They found that the method’s visual and kinesthetic features allow for better cognitive processing among elementary pupils. Similarly, Nuritasari et al. (2024) concluded that the technique’s step-by-step and diagram-based format enhances comprehension and problem-solving, particularly for students who struggle with abstract numerical operations. These findings affirm the method’s adaptability and its role in promoting inclusive, effective mathematics education.

4.5.1 Quick Learning and Retention

Many learners emphasized how easy the method was to grasp. Several stated, “I did not get confused,” and “I did not have a hard time using the Japanese Line Method.” These responses point to the method’s clarity, simplicity, and ability to support retention even with limited practice.

These qualities matter in foundational education, where instructional strategies must meet different readiness levels. This supports Nuritasari et al. (2024), who concluded that the Japanese Line Method effectively helps early learners solve mathematical problems.

Learners’ statements demonstrated not only improved understanding and speed in solving problems but also increased confidence, enjoyment, and willingness to participate in mathematics lessons. These emotional and motivational gains are critical, as affective factors significantly influence long-term academic success.

The method’s simplicity and visual nature made it accessible to a wide range of learners, including those who initially struggled. This reflects Vygotsky’s idea of learning through scaffolded support and confirms the method’s inclusivity. These results resonate with the findings of Kareem et al. (2022), who emphasized increased learner engagement and enjoyment when using the Japanese Line Method.

Overall, the qualitative evidence supports the conclusion that the method does not merely teach multiplication—it enhances learners’ emotional, motivational, and cognitive engagement with mathematics.

Limitations and Future Directions

This study acknowledges several methodological constraints. First, the small sample size (n=22) and cluster sampling within a single intact class limit the generalizability of these findings to broader demographics. Second, as noted, the assessment

instrument lacked formal pilot reliability testing and relied instead on expert content validation.

Future research should address these limitations by incorporating larger, more diverse samples and implementing longitudinal designs to assess the sustained, long-term impact of JLM on multiplication mastery. Additionally, comparative studies against other visual manipulatives or digital math tools are recommended to determine JLM's relative efficacy within the Philippine Department of Education's learning competencies.

Conclusions

The results reveal that JLM is an effective instructional intervention for improving Grade 3 pupils' multiplication performance. The study bridges a gap in local literature by providing evidence of the method's potential to improve conceptual understanding and learner engagement in a Philippine school.

Based on the summary of the findings, the study provides valuable insights into the effectiveness of the Japanese Line Method in enhancing Grade 3 pupils' multiplication skills. The results show that before the intervention, learners struggled with multiplication, as shown by the low pre-test scores; however, after introducing the Japanese Line Method, multiplication skills improved significantly, as reflected in the post-test results. This suggests the method effectively improves immediate learning outcomes and multiplication performance following the intervention. The thematic analysis of learners' perceptions further supports the findings, with students expressing positive emotional responses, increased motivation, and greater engagement in learning. These results align with previous research highlighting the benefits of the Japanese Line Method in improving understanding of multiplication, while adding a new dimension by focusing on learners' problem-solving skills and addressing the cognitive developmental needs of young learners.

The study provides evidence that the Japanese Line Method can effectively support short-term learning gains and improve multiplication performance among Grade 3 pupils. The identified research gap underscores the need to explore further how alternative methods like the Japanese Line Method can meet young learners' cognitive needs while improving their problem-solving skills. While several studies have examined the method's immediate impact, further research is needed to explore its broader classroom applications and effectiveness across different educational contexts. This study contributes to the existing literature by demonstrating the effectiveness of the Japanese Line Method in improving Grade 3 pupils' multiplication performance during the intervention period. However, because the study relied on immediate post-test results, it cannot conclude the long-term retention of multiplication skills. Therefore, this study contributes to the growing body of knowledge on alternative mathematical strategies and provides a practical solution for teachers seeking to improve learners' problem-solving abilities in mathematics.

Based on the study's findings and conclusions, several recommendations are advanced. First, the school administration should integrate the Japanese Line Method into the Grade 3 mathematics curriculum as a supplemental teaching strategy to enhance multiplication skills, including providing teachers with professional development, ensuring sufficient instructional tools, and monitoring student progress to assess its impact. Initao College is also encouraged to promote the integration of innovative strategies like the Japanese Line Method in the Teacher Education Program, as supporting research and training can improve instructional quality and encourage creative learning approaches.

The Teacher Education Program should also include the Japanese Line Method as

part of its teaching strategies, since it fosters active participation, cooperation, and critical thinking skills essential for future teachers. BEED students are encouraged to explore and apply the Japanese Line Method during their practice teaching so they can develop more engaging and effective classroom activities that promote deeper understanding among pupils. Moreover, teachers, especially those at the elementary level, are encouraged to adapt and experiment with the Japanese Line Method to make lessons more interactive, address diverse learning styles, and foster student collaboration. This method also gives Grade 3 pupils a fun, meaningful way to participate in lessons, helping them stay engaged, build confidence, and understand concepts better through movement and interaction. Lastly, future researchers are encouraged to investigate the effectiveness of the Japanese Line Method across different grade levels and subjects to determine its adaptability and long-term impact on academic performance, as well as to compare it with other visual or active learning strategies and explore extended implementation for a more comprehensive understanding of its benefits and limitations.

References

Abari, M.T., & Tyovenda. (2022). The Effect of Japanese Multiplication on Students'Achievement and Retention in Mathematics. International Research Journal of Modernization in Engineering Technology and Science. https://www.researchgate.net/publication/359438163

Aktay, S., & Yılmaz, F. (2025). Teaching Multiplication through the Japanese Multiplication Method: An Action Research study. Necatibey Eğitim Fakültesi Elektronik Fen Ve Matematik Eğitimi Dergisi, 19(1), 142–185. https://doi.org/10.17522/balikesirnef.1537070

Alabi, M. (2024). Visual Learning: The power of Visual Aids and Multimedia. https://www.researchgate.net/publication/385662029

Aliyu, B. (2022). Impact of Japanese Multiplication Technique on Academic Performance among Primary Five Pupils in Tureta, Sokoto State, Nigeria. Zenodo (CERN European Organization for Nuclear Research). https://doi.org/10.5281/zenodo.7050805

Alomiear, S., AlKhamash, A., & Aljadhai, A. (2024). The impact of cognitive activation practices on enhancing student mathematical reasoning in mathematical literacy: A causal comparative study based on PISA 2022. International Journal of Research in Educational Sciences, 7(4), 228–257. https://search.shamaa.org/PDF/Articles/FC/ERIjres/IjresVol7No4Y2024/ijres_2024-v7-n4_228-257_eng.pdf

Azzizah, F. N., Amaliyah, A., Amalia, R., & Muflihah, Z. (2022). Analysis of Multiplication Learning Difficulties in Students. Review of Multidisciplinary Education, Culture and Pedagogy, 1(3), 25–30. https://doi.org/10.55047/romeo.v1i3.220

Chinn, S. (2020). The trouble with maths: A practical guide to helping learners with numeracy difficulties. Routledge. https://doi.org/10.4324/9781003017714

Dumagat, C. R., Dones, N. C., & Susada, B. L. (2024). Integrating Japanese Line Method: A Tool for Multiplication in Third Grade in the Context of Philippine Curriculum. Davao Research Journal, 15(4), 46–58. https://doi.org/10.59120/drj.v15i4.271

Flores, M. M., and Hinton, V. M. (2019). Improvement in elementary student's multiplication skills and understanding after learning through the combination of the concrete-representational-abstract sequence and strategic instruction. Education and treatment of children, 42(1), 73-100. http://dx.doi.org/10.1353/etc.2019.0004

Garain, D., & Kumar, S. (2018). Japanese vs Vedic Methods for Multiplication. International Journal of Mathematics Trends and Technology, 54(3), 228–235. https://doi.org/10.14445/22315373/ijmtt-v54p525

Jamaludin, N. H., & Maat, S. M. (2020). A Systematic Literature Review on Students Misconceptions in Mathematics. International Journal of Academic Research in Business and Social Sciences, 10(6), 127–145

Kareem, A., Abari, & Tyovenda. (2022). The Effect of Japanese Multiplication on Pupils' Interest in Mathematics. International Journal of Research Publication and Reviews. https://www.researchgate.net/publication/360320473

Lasmawan, I. W., & Budiarta, I. W. (2020). Vygotsky's Zone of Proximal Development and the Students' Progress in Learning (A Heutagogical Bibliographical Review). JPI (Jurnal Pendidikan Indonesia), 9(4), 545. https://doi.org/10.23887/jpi-undiksha.v9i4.29915

Merrotsy, P. (2023). Zetetics and the Art of Mathematical Enquiry. Cambridge Scholars Publishing. ISBN-9781443857222, 144385722X

Mills, J. P. (2019). Making multiplication meaningful: Teaching for conceptual understanding. Teachers and Curriculum, 19(1), 17-25. https://doi.org/10.15663/tandc.v19i1.334

Nuritasari, T., Tafrilyanto, A., Aini, & Hasanah Surahmi. (2024). Mathematics Learning Using Japanese Multiplication Method (JAMED) Solving Multiple Problems Class III Basic Education Students. Vygotsky: Jurnal Pendidikan Matematika dan Matematika. https://doi.org/10.30736/voj.v6i2

Sunzuma, G., & Luneta, K. (2023). Zimbabwean Mathematics Pre-Service Teachers' Implementation of the Learner-Centered Curriculum During Teaching Practice. Eurasia Journal of Mathematics Science and Technology Education, 19(5), em2258. https://doi.org/10.29333/ejmste/13131

Thangaraj, V., & Chin, H. (2024). Effectiveness of Japanese Multiplication Method on Improving Grade Two

Malaysian Students' Multiplication Computation Fluency. International Journal of Academic Research in Progressive Education and Development, 13(3). https://doi.org/10.6007/ijarped/v13-i3/22652

Vale, I., & Barbosa, A. (2023). Active learning strategies for an effective mathematics teaching and learning. European Journal of Science and Mathematics Education, 11(3), 573-588. https://doi.org/10.30935/scimath/13135

Villarin, S. J. B., Lapinig, G. C., Divino, D. G. C., Lumahang, K. P., & Echavez, L. F. J. (2025). Crafting a Responsive Teaching Framework for Data Analysis: a phenomenological study on students' experiences in learning descriptive and inferential statistics. Journal of Tertiary Education and Learning, 3(3), 8-22. https://doi.org/10.54536/jtel.v3i3.5483

Zhang, D., Ding, Y., Lee, S., & Chen, J. (2016). Strategic development of multiplication problem solving: Patterns of students' strategy choices. The Journal of Educational Research, 110(2), 159–170. https://doi.org/10.1080/00220671.2015.1060928

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