



# Mathematics Mastery: Enhancing Basic Multiplication Skills of Grade 2 Pupils Using Base 10 Blocks Manipulatives

Angel Mae M. Role<sup>1</sup>; Arlyn F. Fallette<sup>2</sup>; Jay Lad<sup>3</sup>; Queen Ann L. Elan<sup>4</sup>; Rolleen E. Lamoste<sup>5</sup>; Vina S. Vistal<sup>6</sup>; Erap L. Ordaneza<sup>7</sup>; Eutiquiano Umbao<sup>8</sup>

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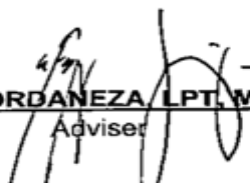
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### APPROVAL SHEET


This Educational Research entitled “MATHEMATICS MASTERY: ENHANCING BASIC MULTIPLICATION SKILLS OF GRADE 2 PUPILS USING BASE-10 BLOCKS MANIPULATIVES” prepared and submitted by ROLE, ANGEL MAE.; FALLETE,, F. ARLYN.; LAD, JAY.; ELAN, QUEEN ANN L.; LAMOSTE, ROLLEEN E.; VISTAL, VINA.; in partial fulfillment of the requirements in the degree, Bachelor of Elementary Education, Generalist has been examined and is hereby endorsed.


  
**ERAP L. ORDANEZA / LPT, MAED-ELT**  
Adviser

### PANEL OF EXAMINERS

APPROVED by the Thesis Committee on Oral Examination with a grade PASSED.

  
**JOSEPHINE G. PAULIN, Ed.D.**  
Chairman

  
**RONALD D. MANOLONG, MAED-ELT**  
Member

  
**VENGIE B. DOYDOY MAEE**  
Member

---

ACCEPTED AND APPROVED in partial fulfillment of the requirements for the Degree of Bachelor of Science in Elementary Education, Generalist.

  
**RONALD D. MANOLONG, MAED-ELT**

VP Research, Development and Extension

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-The Researchers

## **DEDICATION**

We dedicate this research to Casoon Elementary School, whose unwavering commitment to nurturing young minds inspired this study. To the dedicated teachers who tirelessly strive to make learning meaningful, and to the Grade 2 pupils whose enthusiasm, curiosity, and resilience became the heart of this intervention—this work is for you.

-The Researchers

## ABSTRACT

This action research investigated the effectiveness of using Base-10 Blocks as an instructional intervention to enhance the basic multiplication skills of Grade 2 pupils. A mixed-methods approach was employed, integrating quantitative and qualitative data to provide a comprehensive understanding of the intervention's impact. Twenty-eight (28) learners participated in the study. Quantitative data were gathered through pretest and posttest assessments and analyzed using a paired samples *t*-test. Results indicated a statistically significant improvement in learners' performance following the intervention,  $t(27) = -11.55, p < .001$ . The mean pretest score of 4.036 (SD = 2.575) increased to 9.321 (SD = 0.983) in the posttest, demonstrating that the Base-10 Blocks manipulatives effectively strengthened pupils' multiplication skills. Qualitative data, collected through student feedback and thematic analysis, supported the quantitative results. Three major themes emerged: enhanced understanding through visual and hands-on learning, increased engagement and enjoyment, and improved confidence and mathematical ability. Pupils expressed that the manipulatives made learning multiplication more concrete, enjoyable, and easier to understand. Suggestions for improvement included better organization of materials, enlarging visual aids, and incorporating a wider range of activities to maintain clarity and engagement. Overall, findings indicate that Base-10 Blocks are an effective instructional tool for developing foundational multiplication skills among young learners. The study further recommends refining instructional materials and expanding activity designs to optimize learning outcomes and improve classroom implementation.

*Keywords:* Base-10 Blocks, Multiplication Skills, Grade 2 Pupil, Action Research, Manipulatives, Mathematics Instruction, Action Research.

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## CHAPTER ONE INTRODUCTION

### ➤ *Context and Rationale*

Mathematics is one of the most significant disciplines and plays a crucial role in everyday life. It is a foundational subject in elementary education (Velez et al., 2023). Among its core operations, multiplication is essential for developing mathematical literacy (Moreno & Susada, 2024). However, a lack of proficiency in multiplication can hinder students' academic success, creating a major obstacle to their overall mathematical understanding. A Grade 2 teacher from Casoon Elementary School reports that in her class of 28 students, approximately 82% struggle with basic multiplication facts, while only 18% demonstrate competence. She reveals that many learners struggle with recalling multiplication facts, making it difficult for them to progress to higher level concepts. This indicates a substantial gap in foundational math skills that must be addressed. Struggling with basic multiplication significantly affects students' mathematical literacy and academic performance.

According to Dotan and Zviran-Ginat (2022), students who fail to master multiplication facts often encounter challenges with more complex mathematical operations, resulting in decreased confidence, low engagement, and broader academic difficulties. In the context of the Philippines, national and international assessments reveal alarming trends. The Program for International Student Assessment (PISA) 2022 reports an average score of 355 in mathematical literacy among Filipino students—well below the OECD average of 489—signifying below Level 1 proficiency. Similarly, the 2019 Trends in International Mathematics and Science Study (TIMSS) shows a score of only 297 in math (Mullis et al., 2019). These figures demonstrate the urgent need for effective strategies to improve foundational math skills, particularly multiplication.

This study was anchored and supported by the Cognitive Development Theory of Bruner (1969), which emphasizes the importance of progressing through stages of learning—enactive, iconic, and symbolic. In the enactive stage, pupils physically manipulate Base-10 blocks to represent multiplication problems, allowing them to build a concrete understanding of the concept through hands-on experience. As they develop, they move to the iconic stage by visualizing the blocks and interpreting pictorial representations, eventually reaching the symbolic stage where they perform multiplication using abstract numbers and symbols. This theory validates the use of Base-10 blocks as an effective tool in helping Grade 2 pupils master multiplication by grounding their understanding in meaningful, experiential learning.

To address the challenges in multiplication memorization, this study propose an intervention that incorporate active, engaging, and hands-on learning strategies. These include the use of multiplication songs, interactive games, physical activities, and manipulative-based instruction. This approach differ from traditional rote memorization by offer a dynamic and learner-centered environment that align with students' interests and learning preferences. By combine music, movement, and tactile experiences, the intervention aim to create meaningful connections and enhance recall, ultimately lead to improved mathematical performance. Educational research underscores the importance of using multisensory and engaging methods in teaching mathematical concepts. Multi-sensory educational toys significantly increase children's engagement and learning outcomes (Fan Y, et al.). Multiple Intelligences Theory supports the idea that learners absorb information more effectively through various modalities, such as visual, auditory, and kinesthetic. Additionally, studies by Smith (2022) affirm that gamification enhances motivation and retention, making learning more enjoyable and effective. Cardino and Dela Cruz (2020) also emphasize the use of manipulatives, like square tiles and counters, in helping pupil's understand abstract concepts through tangible experiences. These research-based insights justify the need for innovative, interactive approaches to improve multiplication mastery.

Through the implementation of this intervention, pupil's are expected to demonstrate improved speed and accuracy in recalling multiplication facts, resulting in greater confidence and a more positive attitude toward mathematics. Teachers will benefit from having access to more effective instructional strategies that foster student engagement and comprehension. The study's findings may inform future curriculum enhancements and serve as a foundation for professional development programs, encouraging the adoption of innovative teaching practices. Ultimately, addressing multiplication challenges at an early stage is a critical step toward strengthening students' overall mathematical proficiency and academic success.

## **CHAPTER TWO RESEARCH QUESTIONS**

Primarily, the goal of this action research to use Base-10 Blocks as an intervention strategy to improve Grade 2 pupils' basic multiplication skills. As a result, the purpose of this action research aims to seek an answer to the following questions:

- What is the basic multiplication skills performance of Grade 2 pupils before and after the implementation of the Base-10 Blocks intervention?
- How effective are Base-10 Blocks in improving basic multiplication skills among Grade 2 pupils?
- How can the intervention be improved?

- *Null Hypothesis (H<sub>0</sub>)*

There is a significant difference between the pretest and posttest multiplication scores of Grade 2 pupils after the implementation of the Base-10 Blocks intervention, with pupils performing better in the posttest.

## CHAPTER THREE

### PROPOSED INTERVENTION, INNOVATION, STRATEGY

This study employed 'Manipulative Mastery' as an innovative approach to enhancing Grade 2 Pupils basic multiplication skills using Base10 blocks. The intervention aimed to build conceptual understanding by engaging pupils in hands-on manipulation of the blocks, fostered a visual and tactile connection to the abstract concept of multiplication. This strategy, while drew inspiration from traditional methods of using manipulatives, introduced a novel element: gamified activities that transformed practice into engaging challenges. By incorporating interactive games that required pupils to build arrays, solve multiplication problems within a time limit, or match equations with their products, the intervention sought to increase pupils engagement, motivation, and ultimately, fluency and mastery of basic multiplication.

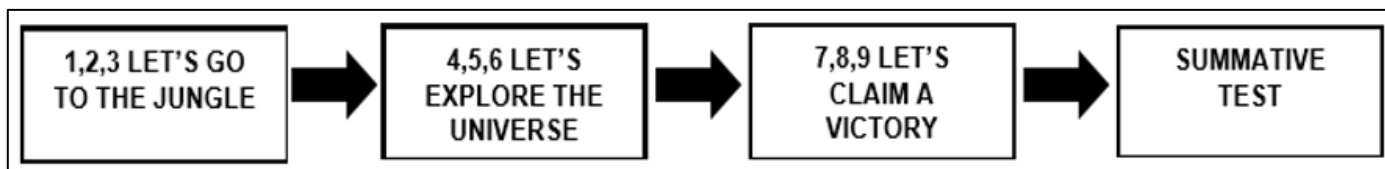


Fig 1 Flow of Strategies

#### ➤ *Session 1.*

The materials were introduced to the class, demonstrating their application in teaching multiplication. Three sets of materials were utilized: one for group activities, another for teacher-led discussions, and the third for the summative test. This strategy involved structuring numbers systematically, ensuring that only the base-10 blocks were counted while excluding the inner blocks. Additionally, before implementation, pupils completed a 10-item pre-assessment to evaluate their initial understanding and establish a baseline for the intervention. Next, pupils were grouped into six and practiced their skills in operating the blocks. To enhance pupils engagement, different themes were incorporated based on number groupings. Each set of numbers discussed in class corresponded to a specific theme, making the learning experience more interactive and relatable. This thematic approach aimed to stimulate pupils' interest and deepen their conceptual understanding by associating numbers with meaningful contexts. This approach promoted accuracy and systematic learning, helping pupils visualize numerical relationships effectively.

#### ➤ *Session 2:*

Let's Go to the Jungle. For teaching numbers 1, 2, and 3 multiplicand and multiplier, a jungle-themed setting was used, where trees, animals, and vines represented numerical structures. Transforming the materials into a jungle-themed setting helped create an immersive learning experience where pupils could actively engage with mathematical concepts. By using animals as representations of numbers and multiplication patterns, pupils could visualize numerical relationships in a way that felt natural and intuitive.

The teacher divided the class into six groups, each provided with Base-10 blocks and charts to solve multiplication problems involving one- to three-digit multipliers and multiplicands. Groups first formed a circle to encourage teamwork as they explored the problem using manipulatives. After group preparation, members lined up and took individual turns answering multiplication expressions. The teacher rang a bell to start a 1-minute answering round during which the student at the front responded while others waited. When the bell rang again, all front-line students hand to raise their answers immediately; those who failed to do so did not have their scores counted. After answering, students moved to the back of the line, and the bell signaled the next cycle, continuing this rotation. The teacher recorded correct responses in real-time, promoting active participation, time management, collaboration, and individual accountability, thereby enhancing students' conceptual understanding and engagement through hands-on, cooperative learning.

#### ➤ *Session 3:*

Let's Explore the Universe. The multipliers 4, 5, and 6 incorporated an intergalactic-themed adventure, exploring the galaxy with planets, stars, and spaceships symbolizing the Base-10 units. With this exciting way to teach multiplication, pupils were able to explore stars, sun, and moon while learning about multiplication and Base-10 units. By integrating these visual metaphors and interactive activities, pupils developed a strong conceptual understanding of multiplication while embarking on an educational journey through space. Pupils reviewed the activity by using the base-10 black activity chart, they formed the blocks using the 1, 2, 3 numbers. After the activity, the teacher used the theme-based materials to introduce the new set of numbers as multipliers.

The teacher began by randomly calling on students to answer questions related to the previous discussion using manipulatives, reinforcing prior knowledge before pupils proceeded to their respective groups. Each group received a set of Base-10 blocks and charts to solve multiplication problems involving 4, 5, and 6 as multipliers and multiplicands. The teacher then selected multiplication expressions from a box, and pupils collaboratively practiced manipulating the blocks to solve them. Afterward, each group formed a line, and members took individual turns answering. The teacher rang a bell to signal the start of each turn, and when the bell rings again, students had to raise their answers immediately. Those who responded moved to the back of the line to allow

the next member to proceed. Throughout the activity, the teacher will continuously recorded correct answers on the scoring board, promoting engagement, accountability, and mastery of multiplication skills.

➤ *Session 4:*

Let's Claim a Victory. Meanwhile, numbers 7, 8, and 9 immersed learners in a Mobile Legends-themed environment, where heroes, battlefields, and mystical powers reinforced number concepts. By integrating these themes, pupils connected mathematical concepts to imaginative and familiar settings, making learning more engaging and meaningful. Pupils reviewed the activity by using the base-10 block activity chart, they formed the blocks using the 4, 5, 6 numbers. After the activity, the teacher used the theme-based materials to introduce the new set of numbers as multipliers.

The teacher began by randomly selecting pupils to review the previous lesson using manipulatives, reinforcing their understanding before they proceeded to their respective groups. Each group was provided with a set of Base-10 blocks and charts to solve multiplication problems involving 7, 8, and 9 as multipliers and multiplicands. The teacher drew multiplication expressions from a prepared box, allowing pupils to collaboratively manipulate the blocks and explore solutions. After the discussion, members formed a line and took individual turns to answer the multiplication problems. The teacher rang a bell to signal the start of each turn, and when the bell rang again, students had to raise their answers immediately. Those who answered will proceed to the back of the line, making way for the next participant. The teacher consistently recorded correct responses on the scoring board, ensuring real-time feedback. This structured and interactive activity promoted active participation, teamwork, and the development of multiplication skills through hands-on and timed engagement.

➤ *Session 5:*

Summative Test. At the end of the discussion, the teacher conducted a comprehensive 15-item summative test focused on multiplication. This assessment was designed to evaluate pupils' understanding and mastery of the concepts covered during the lesson. The test incorporated a diverse range of numbers to ensure a thorough assessment of the students' computational skills and problem-solving abilities. By including all relevant numbers in the test, the teacher aimed to measure the depth of pupils' knowledge, identify areas for improvement, and reinforce their learning through practical application.

## CHAPTER FOUR ACTION RESEARCH METHODS

To explore the effectiveness of Base-10 Blocks manipulatives in developing basic multiplication skills among Grade 2 learners, this action research employed systematic procedures to gather, analyze, and interpret data. The methods outlined below describe the participants, data sources, research instruments, and procedures undertaken throughout the study. These components ensured that the intervention was implemented effectively and that findings were valid, reliable, and grounded on actual classroom performance and observations.

➤ *Participants and Data Source of Information*

The participants of this study were the pupils of Grade 2 in Casoon Elementary School. Table 1 showed the number of participants who took the Pretest and Posttest.

Table 1 The Participants of the Research

Gender	Number of Participants	Percentage
Male	12	43%
Female	16	57%
Total	28	100%

➤ *Data Gathering Method*

To ensure a systematic and organized implementation of the intervention, a structured data gathering process was followed throughout the study. This approach enabled the collection of accurate and meaningful information needed to measure learners’ progress and evaluate the effectiveness of the Base-10 Blocks intervention. The following section outlines the procedures undertaken during data collection, from initial preparation to post-assessment, providing a clear overview of how the intervention was carried out and how data were recorded and analyzed.

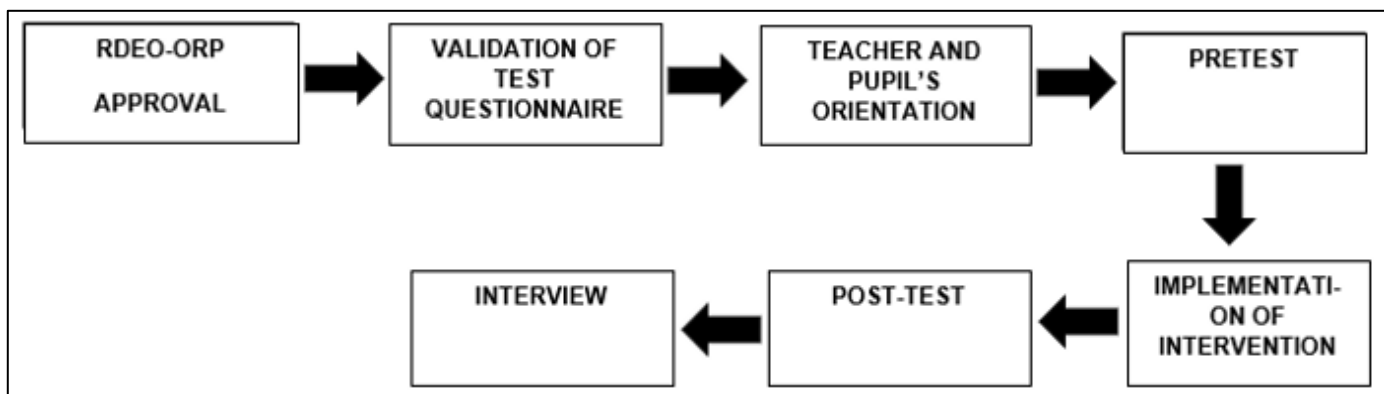


Fig 2 Flow of the Implementation of Intervention

The study commenced after securing approval from the Dean and the Research Development Extension Office (RDEO). Following this, the test questionnaires underwent a validation process to ensure their reliability and relevance. Once validated, an orientation was conducted for both the teacher and students to introduce and explain the intervention, including its objectives, activities, and expected outcomes. A pretest was then administered to assess the pupils’ initial understanding of basic multiplication. This was followed by the implementation of the intervention, which consisted of a series of engaging, theme-based sessions such as “1, 2, 3 Let’s Go to the Jungle,” “4, 5, 6 Let’s Explore the Universe,” and “7, 8, 9 Let’s Claim a Victory.” The hands-on activities, particularly those involving Base 10 Blocks, encouraged active participation and enjoyment among learners. After completing the intervention, a posttest was administered to measure improvements in multiplication skills. Finally, interviews were conducted to collect qualitative feedback from the pupils regarding their learning experiences.

➤ *Data Analysis*

This study employed a mixed-method research design, integrating both quantitative and qualitative approaches for data collection and interpretation. The quantitative component focused on analyzing pupils’ test scores through descriptive and inferential statistics, specifically using the pretest and posttest results. Data analysis was conducted using tabular methods to summarize key findings. According to Hayes (2022), descriptive statistics provide a concise summary of a dataset, representing either an entire population or a sample, which helps in understanding patterns and central tendencies in the data.

First, a pretest was administered before the implementation of the Base-10 Blocks Structured Games to establish a baseline of each pupil’s multiplication proficiency. A posttest followed after the intervention to determine any progress made. The scores were

recorded and compared to assess improvements in learning outcomes. Results showed that pupils' average performance increased from  $M = 4.74$  ( $SD = 2.30$ ) in the pretest to  $M = 8.87$  ( $SD = 1.46$ ) in the posttest, demonstrating a clear enhancement in multiplication skills.

To statistically verify whether this improvement was significant, a paired sample t-test was used. The paired sample t-test is appropriate when comparing two related means, such as the same group of learners tested before and after an intervention (Laerd Statistics, 2018). This test determines if the observed change in scores is statistically meaningful or occurred merely by chance.

The analysis revealed a t-value of 16.27, with 22 degrees of freedom ( $df = 22$ ) and p-value less than .001 ( $p < .0001$ ), indicating a highly significant difference between pretest and posttest results. The mean difference (MD) was 4.13, with a standard error (SE) of 0.25, confirming that the Base-10 Blocks intervention had a strong positive effect. Additionally, the computed Cohen's  $d = 3.39$  suggests a very large effect size, meaning the intervention produced a substantial improvement in pupils' multiplication performance.

The qualitative component of the study involved interviews and classroom observations. Participants were personally interviewed to gather feedback about their experiences and perceptions of the Base-10 Blocks Structured Games. Furthermore, direct observations were conducted during the implementation process to document students' engagement, collaboration, and any challenges encountered. These qualitative findings complemented the quantitative results by providing deeper insight into how and why the intervention influenced pupils' learning.

Finally, all quantitative and qualitative data were analyzed together to evaluate the overall effectiveness of the Base-10 Blocks Structured Games intervention. This comprehensive analysis confirmed its significant contribution to improving pupils' multiplication skills while highlighting areas for further enhancement in instructional delivery.

## CHAPTER FIVE DISCUSSION OF RESULTS

This part includes the discussion of results and reflection of the study.

The data presented in this part follow the arrangement set in the Action Research Questions. Upon the implementation, the collected data and the results of the pre-test and post-test were evaluated and analyzed.

➤ *What is the Basic Multiplication Skills Performance of Grade 2 Pupils Before and After the Implementation of the Base -10 Blocks Intervention?*

Table 2 Paired Sample T-Test

		<b>T</b>	<b>Df</b>	<b>P</b>	<b>Mean Difference</b>	<b>SE Difference</b>	<b>Significance</b>
Pretest	Posttest-	11.55	27	<.001	-5.286	0.363	There is a significance

Table 2 showed the results of the paired sample t-test, which was conducted to determine whether there was a statistically significant difference between the pretest and posttest scores of 28 participants. The results revealed a t-value of -11.55 with 27 degrees of freedom and a p-value less than .001, indicating that the difference between the two sets of scores was highly significant. The mean difference of -5.286 showed that, on average, participants scored 5.29 points higher on the posttest compared to the pretest. The standard error of the difference (SE = 0.363) suggested that this estimate of the mean difference was precise, adding further confidence to the conclusion.

Table 3 Descriptive Results

	<b>N</b>	<b>MEAN</b>		<b>SDSE</b>		<b>P-Value Significance</b>
Pretest	28	4.036	2.575	0.487	0.05	There is a
Posttest	28	9.321	0.983	0.186		significance

Table 3 presents the descriptive statistics for the pretest and posttest scores. The mean score in the pretest was 4.036 (SD = 2.575), while the posttest mean rose to 9.321 (SD = 0.983). This increase in mean scores reflected a clear improvement in performance following the intervention or instructional strategy. The relatively higher standard deviation in the pretest indicated that participants had more varied levels of knowledge or skill before the intervention. In contrast, the lower standard deviation in the posttest implied that the scores became more clustered around the mean, suggesting that the participants not only improved but did so more uniformly. Furthermore, the obtained P-value of 0.05 indicates that the difference between the pretest and posttest results is statistically significant, confirming that the intervention had a meaningful effect on learners’ performance.

Table 4 Participant’s Information

<b>Pseudonym</b>	<b>Gender</b>	<b>Research Code</b>
Mak-Mak	Male	IDIBMS01
Jen-Jen	Female	IDIBMS02
Ron-Ron	Male	IDIBMS03
Boy-Boy	Male	IDIBMS04
Che-Che	Female	IDIBMS05
Joy-Joy	Female	IDIBMS06

Table 4 presents the demographic information of selected participants who were assigned pseudonyms to ensure confidentiality and protect their identities during the conduct of the study. The table includes the learners’ pseudonyms, gender, and corresponding research codes. This coding system was used to systematically organize participant data while maintaining anonymity throughout data collection and analysis. Among the participants listed, there are both male and female learners, reflecting the diverse composition of the Grade 2 class.

This approach adheres to ethical standards in research, particularly the protection of minors involved in academic studies.

➤ *How Effective are Base-10 Blocks in Improving Basic Multiplication Skills Among Grade 2 Pupils?*

The following table presents the essential themes that emerged from the learners’ feedback regarding the use of Base-10 Blocks manipulatives in learning basic multiplication. The qualitative data were gathered through interviews and observations, focusing on pupils’ perceptions, experiences, and reflections during the intervention. Analysis of the responses revealed several recurring ideas that highlight how the Base-10 Blocks strategy supported learners’ mathematical development. As shown in Table

5, the themes emphasize how visual and hands-on learning enhanced understanding, increased engagement and enjoyment, and fostered confidence and improved mathematical skills among the pupils.

Table 5 Essential Themes on Use of Base 10-Blocks Manipulatives

Essential Themes	Core Ideas
Enhancing Understanding Through Visual and Hands-On Learning	<ul style="list-style-type: none"> <li>It helps me see and understand multiplication more clearly.</li> <li>It can solve problems step-by-step.</li> </ul>
	<ul style="list-style-type: none"> <li>The blocks show me how multiplication works.</li> <li>The blocks help me organize numbers.</li> </ul>
Increasing Engagement and Positive Emotional Response	<ul style="list-style-type: none"> <li>It makes multiplication fun and exciting.</li> <li>We enjoy moving the blocks around.</li> <li>It helps us learn without getting bored.</li> <li>Learning multiplication feels like a game.</li> <li>It keeps us interested.</li> </ul>
Building Confidence and Mathematical Skills	<ul style="list-style-type: none"> <li>Used to struggle with multiplication. I feel confident.</li> <li>I no longer feel intimidated.</li> <li>The blocks helped me realize it is just repeated addition.</li> <li>Now, I can apply what I have learned.</li> </ul>

• *Enhancing Understanding Through Visual and Hands-On Learning:*

According to the data in the table, three key themes emerged that addressed research question number 1. The first theme identified was Enhancing Understanding Through Visual and Hands-On Learning. This suggested that students were able to better comprehend and work through multiplication problems by using visual aids and interactive tools provided during the intervention. Mak-Mak initially stated;

*Tung una dili pa kaayo ko kanang kabalo mag times pero katong pagtimes nako gamit tung blocks blocks og katong chart. Kay kabalo balo nako (IDIBMS01).*

(At first, I did not know how to multiply, but when I started using the blocks, I understood. Now I know how to multiply and I'm applying what I have learned).

Additionally, Che-Che Added and Shared her Appreciation to the used Material;

*Nindot ang blocks kay makasabot kog samot unsaon pag multiply (IDIBMS05).*

(The blocks are great because I can understand better how to multiply).

Mak-Mak Inserted the Conversation and Discussed;

*Makita nako ang mga square nga gipilit namo titser mao nga dali nako masabtan ang answer sa multiplication expression kay akong ihapon (IDIBMS01).*

(I can see the blocks that represent the numbers, so it is easy for me to understand the answer regardless of the multiplication expression).

Jen-Jen Cited Her Argument and Shared;

*Ang Base 10 blocks makatabang kay makita nako kung pila ang grupo nga mga blocks ang ihapon ug kung unsaon pag-multiply (IDIBMS02).*

Base 10 blocks help me because I can see how many groups there are and how to multiply.

Ron-Ron Added His Statement;

*Mas sayon ang pag-solve sa multiplication expression kung gamit ang blocks kay makita nako ang mga space sa blocks katong naay mga lines ma'am (IDIBMS03).*

(It's easier to solve problems using blocks because I can see the units and tens, ma'am).

Mon-Mon Shared His Insight;

*Nakatabang sa pag organize sa number aron mas masabtan ang multiplication expression titser. (IDIBMS04).*

(It helps to organize the numbers so that I can understand the multiplication better).

On the Same Side Joy-Joy Stated;

*Nindot kaayu gamiton ang blocks ug ang charts ma'am kay mag tabangay mi sa akong ka grupo tapos dali rapud mi maka solve ug multiply- multiply teacher Kay amo rang ibutang sa box ang blocks tapos mag ihap- ihap rami (IDIBMS06).*

(I really appreciate using the blocks and charts, teacher. They a huge help to my group and me, we can easily solve multiplication problems by placing the blocks in the box and counting them).

Meanwhile Ron-Ron Shared;

*Ang mga blocks makatabang nako mag-ihap ihap ug karon teacher, ganahan na ko sa multiplication (IDIBMS03).*

(The blocks helped me understand where the multiplier and multiplicand are. Now, I just count how many blocks there are to find the answer).

The theme is directly supported by Bruner's Cognitive Development Theory (1969), which highlights the progression of learning through the enactive, iconic, and symbolic stages. In the enactive stage, pupils physically manipulated Base-10 blocks during the intervention, which helped them concretely understand multiplication concepts through direct, hands-on experience. As they advanced, they entered the iconic stage, where they began to visualize and interpret images of the blocks, further enhancing their comprehension. Finally, in the symbolic stage, students were able to solve multiplication problems using abstract symbols and numbers. The use of Base-10 blocks, as described by Bruner, reinforced this theme by demonstrating that visual and interactive tools facilitated deeper understanding and supported the cognitive development of Grade 2 pupils as they moved through each learning stage.

This approach aligns with the constructivist perspective, emphasizing that learners actively build their own understanding through experience and reflection. The integration of manipulatives like Base-10 blocks allows pupils to connect concrete actions with abstract thinking, bridging the gap between doing and knowing. Such tools not only promote conceptual clarity but also foster engagement and motivation, as learners find meaning in tangible exploration. Thus, the use of Base-10 blocks does not merely aid in solving mathematical problems but nurtures cognitive growth by allowing pupils to internalize concepts at their own pace and in developmentally appropriate ways.

When it comes to the educational field, manipulatives can be understood as any physical, pictorial or virtual objects used as resources in the teaching of a certain knowledge" (Silveira, Powel & Grando, 2020).

- *Increasing Engagement and Positive Emotional Response:*

According to the data, the pupils showed heightened interest and enthusiasm while engaging with the intervention activities. The materials made multiplication enjoyable and engaging, encouraging learners to participate eagerly. As stated by the students, interacting with the blocks and colorful materials transformed learning into a fun experience, helping maintain their focus and motivation. Mak-Mak shared his experience;

*Makita nako ang mga square nga gipilit namo titser, mao nga dali nako masabtan ang answer sa multiplication expression kay akong ihapon. (IDIBMS01)*

(I can see the blocks that represent the numbers, so it's easy for me to understand the answer regardless of the multiplication expression).

Jen-Jen Stated her Viewpoint;

*Ang Base 10 blocks makatabang kay makita nako kung pila ang grupo nga mga blocks ang ihapon ug kung unsaon pag-multiply (IDIBMS02).*

(Base 10 blocks help me because I can see how many groups there are and how to multiply).

Ron-Ron Presented his Opinion and Elaborated on his Thoughts;

*Mas sayon ang pag-solve sa multiplication expression kung gamit ang blocks kay makita nako ang mga space sa blocks katong naay mga lines ma'am. (IDIBMS03)*

(It's easier to solve problems using blocks because I can see the units and tens, ma'am).

Boy-Boy Cited his Idea;

*Nakatabang sa pag organize sa number aron mas masabtan ang multiplication expression, titser. (IDIBMS04).*

(It help to organize the numbers so that, I can understand the multiplication better)

Che- Che Added their Conversation;

*Gamit ang Base 10 blocks, makita nako ang resulta sa multiplication expression step-by-step ma'am. (IDIBMS05)*

(Using Base 10 blocks, I can see the result of each multiplication expression step-by-step, ma'am.)

Joy- Joy Made her Claim and Clarified her Point;

*Masmapadali ang amoang gihimo titser sa pag-solve kay klaro ang tanan unsaon pag answer (IDIBMS06).*

(It makes it faster to solve complicated problems, teacher, because everything is clear).

The materials made multiplication enjoyable and engaging, encouraging learners to participate eagerly. As stated by the students, interacting with the blocks and colorful materials transformed learning into a fun experience, helping maintain their focus and motivation. This observation is closely aligned with the Cognitive Development Theory, particularly the enactive stage, where pupils learn best through physical interaction and hands-on experiences. By manipulating Base-10 blocks and using colorful materials, learners were actively involved in the learning process, which made abstract mathematical concepts more accessible and enjoyable. Bruner emphasized that when students are meaningfully engaged through concrete experiences, their motivation increases and learning becomes more effective. Thus, the pupils' enthusiasm and sustained attention can be explained by the theory's view that interactive and tangible learning experiences foster deeper interest and improved cognitive engagement.

The constructivist way of teaching multiplication and division suggested that students should have been provided with opportunities for concrete and hands-on learning experiences (Quigley, 2021).

- *Building Confidence and Mathematical Skills:*

Based on the pupils' reflections, the intervention not only improved their understanding of multiplication but also boosted their self-assurance. Learners expressed that they no longer felt anxious or confused about solving problems. The use of blocks made the concept clearer, allowing them to see multiplication as a simple, manageable task.

Man of them shared how they now felt capable of applying what they had learned confidently. Mak- Mak shared her experience;

*Yes titser ganahan kaayu mi mag gamit ug katong blocks ug charts kay maka play- play man mi sa blocks teacher tapos among makita ang numbers malingaw kaayu mi teacher kay ma lihok- lihok namo ang blocks tapos mas dali maka multiply- multiply kay makita namo ang number tapos malihok lihok namo ang blocks (IDIBMS01).*

(Yes, teacher! We really enjoy using the blocks and charts. We have fun playing with the blocks, and it is great to see the numbers come alive. Were delighted because we can move the blocks around, making multiplication easier to grasp. By visualizing the numbers and manipulating the blocks, we can better understand the concept).

Jen-Jen Stated Her Insights;

*Mas ganahan kaayu mi mag gamit ug blocks ug chart teacher Kay mura mig ga dula tapos maka multiply mi teacher tapos makita namo unsaon sya tapos teacher kanang dali mi maka sabot kay makita man namo tapos dili sad mi ma bored teacher (IDIBMS02).*

(We love using the blocks and charts, teacher, because it is like playing a game. We get to multiply and see how it works, and it is easy for us to understand because we can see it. We don't get bored, teacher).

Additionally Ron-Ron Give his Comment;

*Opo teacher excited kaayu mi mag gamit atong blocks ug charts teacher kay ma lihok namo ang blocks teacher tapos maka tabang sya sa amoa teacher kay para de namo ma limitan ang among answer teacher tapos amo mang makita ang blocks unya pwede ra namo balikon ug ihap teacher (IDIBMS03).*

(Yes, teacher, we are very excited to use the blocks and charts, teacher, because we get to move the blocks around and it helps us. It prevents us from forgetting our answers, teacher, because we can see the blocks and re-count them).

Boy- Boy Shared his Experience;

*Mag gamit mi ug blocks teacher kay lipay kaayu mi kay magunitan namo ang blocks tapos dali ra namo masabtan teacher kay amo syangmagunitan tapos ma lihok<sup>2</sup> namo ang blocks tapos among answer teacher kay amo ibutang sa papel teacher. (IDIBMS04).*

(Were using the blocks teacher, because were so happy to learn by using them. It is easy for us to understand teacher, because we get to see the blocks, move them around, and write our answers on paper).

Jen-Jen Added Her Idea;

*Ganahan mi sa base 10 blocks ug charts kay kay dali mi maka sabot unya nindot kay siya sa among lesson teacher kay mag bagis pami sa among papel di pariha sa blocks ug charts nga among siyang e lihok tapos lingaw sad siya ihapon teacher kay amo siyang eh tudlo-tudlo (IDIBMS05).*

(We love using Base 10 blocks and charts, because it is really fun and easy to understand. It is even better than our usual lessons. We get excited moving the blocks and charts around on our paper, and it's fun too! It really helps us learn, teacher (IDIBMS05).

Joy- Joy Cited Her Argument and Shared;

*Nindot kaayu gamiton ang blocks ug ang charts ma'am kay mag tabangay mi sa akong ka grupo tapos dali rapud mi maka solve ug multiply teacher kay amo rang ibutang sa box ang blocks tapos mag ihap- ihap rami (IDIBMS06).*

(I really appreciate using the blocks and charts, teacher. They are a huge help to my group and me. We can easily solve multiplication problems by placing the blocks in the box and counting them).

Ron- Ron Added to their Converstion;

*Ang blocks nakatabang nako pagsabot sa kong asa dapit ang multiplier ug multiplicand karon, tapos ihapon dayun kong pila kabuok ang blocks para mahibal an kong unsay answer (IDIBMS03).*

(The blocks helped me understand where the multiplier and multiplicand are. Now, I just count how many blocks there are to find the answer).

Boy- Boy Deliver his Insight;

*Kung mogamit ko sa blocks, kahibalo ko unsa akong buhaton malipay ko kay makuha nako ang sakto nga tubag (IDIBMS04).*

(When I use the blocks, I know what to do. I feel happy because I can get the right answer).

Che- Che Shared Her Statement;

*Sauna, lisudan ko sa multiplication pero karon lingaw na ang blocks nakatabang sa ako pag-solve (IDIBMS05).*

(Before, I found multiplication difficult, but now it is fun! The blocks helped me solve problems).

Jen-Jen Added Her Point of View;

*Ang mga blocks makatabang nako mag ihap-ihap ug karon teacher, ganahan na ko sa multiplication. (IDIBMS06).*

(The blocks help me count, and now I feel good at multiplication).

Learners expressed that they no longer felt anxious or confused about solving problems. The use of blocks made the concept clearer, allowing them to see multiplication as a simple, manageable task. Many of them shared how they now felt capable of applying what they had learned confidently. This finding is well-supported by Bruner’s Cognitive Development Theory (1969), particularly the enactive stage, where learners gain understanding through physical manipulation and active exploration. By using Base10 blocks, students were able to grasp abstract mathematical concepts through concrete, tangible experiences. This hands-on approach reduced confusion and built a strong foundation, which in turn boosted their confidence. As pupils progressed to the iconic and symbolic stages, they became more independent and proficient, leading to a deeper sense of competence. According to Bruner, when students are guided through these developmental stages with meaningful experiences, their cognitive growth is accompanied by increased confidence and a positive attitude toward learning.

Building confidence in math is not just about improving grades; it’s about empowering students to approach challenges with a positive mindset and belief in their abilities. Guiding pupils with good materials helps them learn more and boosts their confidence in solving problems. (Carlington, 2024).

➤ *How Can the Intervention Be Improved?*

Table 6 presents the essential themes that emerged from the learners’ feedback regarding the use of Base-10 Blocks manipulatives in enhancing their understanding of basic mathematical concepts. The responses highlight key insights into both the strengths of the intervention and areas for further improvement. Learners acknowledged the enjoyable and engaging nature of the activity, noting that the colorful and hands-on materials helped make learning more fun.

Table 6 Essential Themes on use of Base 10-Blocks Manipulatives

Essential Themes	Core Ideas
Enhancing Teaching Materials and Tools	<ul style="list-style-type: none"> <li>• Blocks getting disorganized or lost. Pictures being too small.</li> <li>• Confusion when using too many blocks.</li> </ul>
Providing Instructional Support and Varied Activities	<ul style="list-style-type: none"> <li>• More examples and activities.</li> <li>• Use of the blocks in broader topics like addition and subtraction.</li> </ul>
Recognizing Positive Reception While Encouraging Reflection	<ul style="list-style-type: none"> <li>• It was fun or colorful.</li> <li>• They had nothing to improve.</li> </ul>

• *Enhancing Teaching Materials and Tools:*

According to student’s feedback, while the teaching materials offered valuable support in demonstrating mathematical concepts, some challenges emerged during implementation. Pupils encountered issues such as blocks becoming disorganized or getting lost, and some visuals being too small to see clearly. These factors occasionally led to confusion, particularly when too many blocks were in use at once. As expressed by Ron-Ron;

*Magamit unta ang base 10 blocks sa addition ug subtraction ma'am (IDIBMS03).*

(Hopefully the base 10 blocks will be used in addition and subtraction).

Mak-Mak gave his taughts;

*Gagmay kaayo ang picture (IDIBMS01).*

(The pictures are too small).

Meanwhile, Jen- Jen talked about her experience;

*Pag daghan ang blocks kay malibog nako (IDIBMS02).*

(If there are too many blocks, I get confused).

*Ron-Ron added to the conversation;*

*Pag masanghiran ang blocks, kay di na matarong,*

*Kay, naisbog na ang arrange (IDIBMS03).*

(When the blocks are bumped, they are not arranged properly, because the arrangement is messed up).

Boy-Boy told us what he did;

Pag kadugayan na mag ihap, kay makalimot na pila kay balik napod una (IDIBMS04).

(If I count for too long, I forget how many there are, so I have to start over again).

Che-Che shared about what she noticed;

*Pag dako na ang e times, kay madugay pa ug ihap, kuan, bisan human na ang time na mag answer (IDIBMS05).*

(If the multiplication problem has a big number, it takes a long time to count even after the time to answer is up).

Also, Joy-Joy shared her experience;

*Kanang kuan magkasagol ang mag block Kay mawalaan og makasagol sagol. Dili na masaktog ihap (IDIBMS06).*

(The blocks can get lost or mixed up. Then, we cannot count properly).

Pupils encountered issues such as blocks becoming disorganized or getting lost, and some visuals being too small to see clearly. These factors occasionally led to confusion, particularly when too many blocks were in use at once. This situation can still be understood within the framework of Bruner's Cognitive Development Theory. While the enactive stage emphasizes the importance of hands-on learning through physical manipulation, it also implies the need for well-structured and thoughtfully designed materials to ensure effective learning. When the tools—such as Base-10 blocks—are not organized or appropriately presented, the cognitive load can increase, leading to confusion rather than clarity. Bruner's theory supports experiential learning, but it also highlights the necessity of scaffolding and gradually guiding learners through the stages. The challenges reported suggest that while the use of manipulatives aligned with the enactive stage, optimal learning depends on careful implementation and management of materials to prevent interference with the learning process.

Develop the project-based learning model using gamification which can be used as a guideline to develop the project-based learning system using gamification to enhance 21st century learners (Wanglang,2023).

- *Providing Instructional Support and Varied Activities.*

Providing Instructional Support and Varied Activities. Based on the feedback, pupils expressed a desire for more examples and a wider range of activities to deepen their understanding. They appreciated the use of Base-10 blocks and suggested expanding their use beyond multiplication to include topics such as addition and subtraction. This reflected their growing interest in hands-on learning and their recognition of how manipulatives helped clarify mathematical concepts. Joy- Joy shared, *Maghatag pa untag dugang nga examples ug activities kay ma enjoy ko (IDIBMS06).*

(Hopefully, you can provide more examples and activities because I enjoy doing it).

On the same side, Jen-Jen stated;

Lahi napod na theme ma'am, roblox dili naman kaayo uso ml (IDIBMS02).

(Maybe we can have a different theme, ma'am? Roblox is more popular than mobile legends now).

Students appreciated the use of Base-10 blocks and suggested expanding their use beyond multiplication to include topics such as addition and subtraction. This reflected their growing interest in hands-on learning and their recognition of how manipulatives helped clarify mathematical concepts. The theory emphasizes the importance of progressing through stages of learning; enactive, iconic, and symbolic. The students' desire for more varied and extended activities demonstrates their engagement in the enactive stage, where physical manipulation of learning tools plays a crucial role in constructing understanding. Their interest in applying Base-10 blocks to other operations shows that they are actively seeking continued experiential learning, which supports Bruner's belief in spiral curriculum, revisiting concepts at increasing levels of complexity. The feedback underscores the need for sustained instructional support and diverse, meaningful activities that match learners' developmental stages and foster deeper conceptual understanding. When it came to the educational field, manipulatives were understood as any physical, pictorial or virtual objects used as resources in the teaching of a certain knowledge (Silveira, Powel & Grando, 2020, p. 01, in press).

- *Recognizing Positive Reception while Encouraging Reflection:*

According to the feedback gathered, pupils responded positively to the intervention, frequently describing the activities as fun and colorful. The vibrant materials and interactive approach captured their attention and made the learning experience more

enjoyable. Many students expressed satisfaction with the activity, stating that there was nothing they would change or improve. Jen-Jen commented;

*Nindot naman siya kay daghanog colors (IDIBMS02).*

(It is nice because it has many colors).

Che-Che shared her thought;

*Okay ra man inyuhang gihimo titser. (IDIBMS05).*

(The implementation was good so far, teacher).

Mak-Mak also indicated the same thought;

*Wala man, okay raman siya (IDIBMS01).*

(It is okay, just like that Ma'am).

Ron-Ron added his idea;

*Wala ko kabalo unsay e dugang sir. (IDIBMS03)*

(I do not know what to add Sir).

Che-Che exclaimed;

*Okay naman kay nalingaw nami (IDIBMS05)*

(It's okay because we had fun).

*Ambot lang wala madungag (IDIBMS06).*

(I do not know, I do not have anything to add).

The vibrant materials and interactive approach captured their attention and made the learning experience more enjoyable. Many students expressed satisfaction with the activity, stating that there was nothing they would change or improve. This outcome is well supported by Bruner, particularly the enactive stage, which emphasizes learning through direct, physical engagement with materials. The use of Base-10 blocks, along with colorful and interactive resources, provided a stimulating environment that fostered curiosity and enjoyment—key factors in maintaining motivation and interest. Bruner believed that learning should be not only meaningful but also engaging, and that positive emotional connections enhance cognitive development. The pupils' enjoyment and satisfaction reflect the effectiveness of a well-designed enactive learning experience, where hands-on activities are both educational and enjoyable, reinforcing conceptual understanding through active participation.

Base ten blocks may helped children with cognitive disabilities comprehend mathematics, according to studies. Additionally, adopting digital learning resources increased their passion and made learning fun (Prabavathy, R. Sivaranjani, N. Alex. 2023).

## **CHAPTER SIX**

### **KEY FINDINGS OF THE STUDY**

The findings of the study revealed the basic multiplication skills performance of Grade 2 pupils before and after the implementation of the Base-10 Blocks intervention. The pretest results indicated that most pupils had limited understanding and mastery of multiplication concepts, as reflected in their low scores. Many struggled to interpret multiplication as repeated addition and had difficulty in visualizing number relationships. After the intervention, the posttest results showed a significant improvement in their performance. Pupils demonstrated a clearer grasp of multiplication processes, were able to solve problems more accurately, and showed greater confidence in applying the concepts learned. This indicates that the Base-10 Blocks intervention positively influenced their learning outcomes.

In terms of effectiveness, the results of the paired sample t-test showed that the Base-10 Blocks intervention was statistically significant in improving the pupils' basic multiplication skills. The learners' enhanced scores after the intervention highlight the effectiveness of using concrete manipulatives in mathematics instruction. The intervention helped bridge the gap between abstract concepts and practical understanding by allowing pupils to physically represent numbers and operations. This active, hands-on experience made learning more meaningful, especially for young learners who benefit from visual and tactile learning materials. The results support the idea that using Base-10 Blocks effectively strengthens pupils' comprehension and engagement in learning multiplication.

Furthermore, qualitative feedback from the participants revealed that pupils found the use of Base-10 Blocks enjoyable and motivating. They expressed that the manipulatives made multiplication easier to understand and more fun to learn. Many pupils mentioned that the blocks helped them visualize the grouping and repeated addition involved in multiplication, which reduced confusion and increased their confidence in solving problems. The intervention not only improved academic performance but also fostered a more positive attitude toward mathematics, demonstrating that meaningful learning can occur when learners are actively engaged in interactive, enjoyable activities.

Lastly, the results indicated several ways to further improve the intervention. Pupils suggested that incorporating more colorful and creative materials could make the activity even more engaging. They also recommended integrating group work and games using Base-10 Blocks to promote collaboration and sustain interest during lessons. Teachers, on the other hand, could enhance the intervention by providing gradual guidance from concrete manipulation to symbolic representation to ensure mastery at each learning stage. These insights highlight that while the Base-10 Blocks intervention is effective, it can be strengthened through continuous refinement, integration of playful learning strategies, and consistent teacher support to maximize its impact on learners' mathematical development.

## **CHAPTER SEVEN**

### **IMPLICATIONS OF THE STUDY**

The outcomes of this study present valuable implications for various educational stakeholders. By examining the impact of the Base-10 Blocks intervention on improving Grade 2 pupils' multiplication skills, the findings emphasize the importance of integrating hands-on, manipulative-based strategies in early mathematics instruction. These implications extend beyond classroom application, offering meaningful insights for the school, pupils, parents, and future researchers. Each stakeholder can draw practical lessons from the results to further enhance teaching practices, learning engagement, and the overall quality of mathematics education.

➤ *School:*

The findings of this study offer practical benefits for the school as they highlight the effectiveness of Base-10 Blocks in strengthening the multiplication skills of Grade 2 learners. The hands-on approach aligns with the institution's objective of enhancing numeracy performance and promoting meaningful learning experiences in Mathematics. Moreover, the results provide empirical support for adopting manipulative-based instruction as a strategy to improve learner engagement, conceptual understanding, and mastery across grade levels.

➤ *Pupils:*

The study demonstrates significant advantages for the Grade 2 pupils of Casoon Elementary School, who served as the direct beneficiaries of the intervention. Through the use of Base-10 Blocks, learners developed a clearer grasp of basic multiplication concepts. The learning intervention led to: (1) enhanced number sense, (2) increased motivation and active participation in mathematics activities, (3) improved accuracy in solving multiplication problems, and (4) greater confidence in their mathematical abilities. These outcomes affirm that concrete manipulatives enhance foundational numeracy skills among young learners.

➤ *Parents:*

The results provide parents with insights into the value of visual and tactile learning tools in supporting children's mathematical development. The effective use of Base-10 Blocks underscores the importance of parental involvement in reinforcing numeracy skills at home. Parents may adopt similar strategies to support their children's learning progress, thereby strengthening the partnership between home and school in promoting academic growth.

➤ *Future Researchers:*

This study serves as an evidence-based reference for future researchers who aim to explore innovative and learner-centered strategies in mathematics education. It highlights the common challenges faced by learners in multiplication and presents concrete manipulatives as a viable solution. Future studies may expand this research by applying manipulative-based instruction to other mathematical concepts, higher grade levels, or larger populations to further validate its effectiveness and explore additional pedagogical insights.

## **CHAPTER EIGHT**

### **REFLECTION**

The researchers have come to reflect that the intervention implemented—using Base 10 Blocks Manipulatives—had a meaningful and positive impact on the Grade 2 learners of Casoon Elementary School. Based on the results gathered, there was a notable improvement from the pretest to the posttest, clearly indicating that the objective of the research was successfully achieved. Initially, most students struggled with solving basic multiplication problems. However, after the intervention, the learners demonstrated a much stronger grasp of the concepts.

Throughout the implementation phase, the researchers encountered challenges that pushed them to become more resilient and adaptive as facilitators. Despite those obstacles, it was evident that the pupils were highly engaged, participative, and genuinely excited during each session. Their enthusiasm was most evident during the group activities, especially when themes like "1,2,3, Let's Go to the Jungle!", "4,5,6, Let's Explore the Universe!", and "7,8,9, Let's Claim a Victory!" were introduced. These creative sessions not only made learning more enjoyable but also fostered cooperation and curiosity among the learners. The use of Base 10 Blocks allowed students to understand multiplication visually and tangibly, which made a noticeable difference in their learning outcomes.


The researchers observed consistent improvement in the learners' participation, confidence, and accuracy as they progressed through the activities. Their enjoyment while manipulating the blocks reflected how effective hands-on learning could be, especially in early math instruction. The researchers were grateful for the warm reception and support received from the supervising teacher, the pupils, and the school community. Through continuous revisions and thoughtful execution of the intervention, the researchers identified its strengths and limitations, which were valuable for future educational innovations. This experience reminded the researchers that success in action research requires persistence, reflection, and a deep understanding of learners' needs. As future educators, the researchers were proud to have contributed a meaningful approach that promoted mastery and love for learning mathematics.

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## APPENDIX

### APPENDIX 1



# MonCAST

2017 Research & Publication  
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## Office of Research and Publication

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Revision No.	Effective Date
00	01.01.2025

**INTERVIEW GUIDE QUESTIONS**

**Researcher(s):** Angel Mae M. Role, Arlyn E. Fallete, Jay Lad, Queen Ann L. Efan, Rollen E. Lamoste, Vina S. Vistal

**Research Title:** Mathematics Mastery: Enhancing Basic Multiplication Skills of Grade-2 pupils Using Base 10- Blocks Manipulatives

**Purpose of the Study:**  
The purpose of this study is to enhance the basic multiplication skills of Grade 2 pupils through the use of Base 10 Blocks manipulatives. This study aims to determine the effectiveness of these hands-on learning tools in improving students' understanding of multiplication concepts, fostering deeper numerical comprehension, and increasing engagement in mathematics. By integrating manipulatives into instruction, the study seeks to address common learning difficulties and develop a more concrete foundation for multiplication, ultimately contributing to improved mathematical performance among young learners.


**Research Questions**

**2: How effective are Base-10 Blocks in improving basic multiplication skills among Grade 2 pupils?**

- 2.1. How do Base-10 Blocks improve students' ability to solve multi- step multiplication problems?
- 2.2. Do Grade-2 learners show a higher level of engagement during Base-10 Blocks activities compared to traditional math lesson?
- 2.3. Do pupils show increased confidence in solving multiplication problems after using Base-10 Blocks?

**3. How can the intervention be improved?**


- 3.1. *What are the weaknesses of the strategy/material?*
- 3.2. *What suggested changes you can suggest to improve the material?*



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e-mail: [igumoncast2008@gmail.com](mailto:igumoncast2008@gmail.com) | Telephone No: (084) 6571 878

APPENDIX 2



# MonCAST

Office of Research and Publication

Permit to Conduct the Study

<b>Document Code No.</b>	
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<b>Revision No.</b>	<b>Effective Date</b>
<b>00</b>	<b>01.01.2025</b>

March 7, 2025

**ROLANDO P. ENGBINO**  
Principal I  
Casoon Elementary School  
Casoon, Monkayo, Davao de Oro

Sir:

Greetings!

We, **Jay Lad, Rolleen Lamoste, Queen Ann Elan, Vina Vistal, Angel Mae Role, and Arlyn Fallete** are students from Monkayo College of Arts, Sciences and Technology (MonCAST), taking up **Bachelor of Elementary Education- Generalist**. At the moment, we are on the phase of conducting our research study in relation to our field.


In this regard, we would like to ask for your permission to allow us to conduct our study entitled **"Mathematics Mastery: Enhancing Basic Multiplication Skills of Grade-2 Pupils Using Base 10-Blocks Manipulatives"** in your esteemed institution. The purpose of our study is to enhance the basic multiplication skills of Grade 2 learners through the use of Base 10 Blocks manipulatives. This study aims to determine the effectiveness of these hands-on learning tools in improving students' understanding of multiplication concepts, fostering deeper numerical comprehension, and increasing engagement in mathematics.


Your kind assistance to our request will help us in effectively achieving our desired results and will be used as basis for further studies. Furthermore, the success of this study will surely gauge the development of our knowledge and practice of our field which will eventually bring progress to our community where we belong.


Hoping for your wholehearted support and consideration of our fervent request.

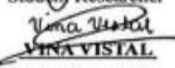
Thank you and God bless.

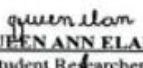
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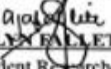
  
**JAY LAD**  
Student Researcher

  
**ANGEL MAE ROLE**  
Student Researcher


  
**ROLLEEN LAMOSTE**  
Student Researcher

  
**VINA VISTAL**  
Student Researcher


  
**QUEEN ANN ELAN**  
Student Researcher


  
**ARLYN FALLETE**  
Student Researcher

Endorsed:


  
**ERAP L. ORDANEZA, PT, MAED-ELT**  
Research Adviser

Noted:

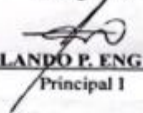
  
**KENNETHAGA B. SAGARINO, MED-SPED**  
Research Director


  
**RONALD D. MANOLONG, MAED-ELT**  
VP- Research, Development and Extension

Recommending Approval:

  
**GARY P. LAGATIERA, EdD**  
College President

Approved:

  
**ROLANDO P. ENGBINO**  
Principal I



**ALCUCOA Accredited**  
Address: Purok 6, Poblacion, Monkayo, Davao de Oro 8805  
e-mail: [igumoncas12008@gmail.com](mailto:igumoncas12008@gmail.com) | Telephone No.: (084) 8371-878

**APPENDIX 3**

**Researchers:** Jay Lad, Rolleen Lamoste, Vina Vistal, Queen Ann Elan, Arlyn Fallete, Angel Mae Role

**Research Title:** Mathematics Mastery: Enhancing Basic Multiplication skills of Grade 2 pupils using Base-10 Blocks Manipulatives

**Research Code:** AR2025\_18

**Research Question No. 1:** What is the basic multiplication skills performance of grade 2 pupils before and after their implementation of the base -10 blocks intervention?

Participants	Pretest (10 items)	Posttest (10 items)
Pupil 1	10	10
Pupil 2	8	10
Pupil 3	7	10
Pupil 4	7	10
Pupil 5	7	10
Pupil 6	6	10
Pupil 7	6	10
Pupil 8	6	10
Pupil 9	5	10
Pupil 10	5	10
Pupil 11	5	10
Pupil 12	5	10
Pupil 13	4	10
Pupil 14	4	10
Pupil 15	4	10
Pupil 16	4	9
Pupil 17	4	9
Pupil 18	3	9
Pupil 19	3	9
Pupil 20	2	9
Pupil 21	2	9
Pupil 22	2	9
Pupil 23	2	9
Pupil 24	1	9
Pupil 25	1	9
Pupil 26	0	8
Pupil 27	0	7
Pupil 28	0	6

APPENDIX 4

**Research Title: Mathematics Mastery: Enhancing Basic Multiplication Skills of Grade 2 Pupils Using Base-10 Blocks Manipulative**  
**Research Code: AP2025 18**

**Research Question No. 2: How effective are Base-10 Blocks in improving basic multiplication skills among Grade 2 pupils?**

TRANSCRIPTION	TRANSLATION
<p><b>Pupil # 1</b></p> <p>Tung una dili pa kaayo ko kanang .. kabalo ma times pero katong pagtimes nako.... gamit tung blocks...blocks... og katong chart.... Kay kabalo balo nako.</p>	<p>(At first, I didn't know how to multiply, but when I started using the blocks, I understood. Now I know how to multiply and I'm applying what I've learned.)</p>
<p><b>Pupil # 2</b></p> <p>Kanang Kuan ... sauna magtimes ko kay...kay ...mag ihap ihap ko sa akong kamot.... Og ... og magbagis bagis ko.. karon Kay na ganahan ko sa pag times kay... lingaw ang blocks ... og katong chart makaanswer pod ko</p>	<p>( Before, I used to count on my fingers or draw lines to count. But now, I enjoy learning multiplication because the blocks are fun and the chart helps me find the correct answers.)</p>
<p><b>Pupil # 3</b></p> <p>Dili ko.. kaayo kabalo ko times ... (kotkot sa Ulo ) pero karon kabalo<sup>2</sup> nako</p>	<p>(I didn't really understand multiplication... (scratches head) ...but now I've mastered it!)</p>
<p><b>Pupil # 4</b></p> <p>Kanang sauna nakulbaan ko mag multiply<sup>2</sup> .. kanang.. basin mamali ko . Karon Kay Kay Dalian nako Kay add add ra diay siya .</p>	<p>(Before, I was intimidated by multiplication, fearing I'd make mistakes. But now, I've discovered it's just a matter of repeated addition.)</p>
<p><b>Pupil # 5</b></p> <p>Nindot ang blocks blocks Kay... Kay makasabot kog samot unsaon pag multiply.</p>	<p>(The blocks are great because... because I can understand better how to multiply.)</p>
<p><b>Pupil # 6</b></p> <p>Nakabalo na gyud ko unsa ang pamaagi para mapadali ang pag times... Ganahan ko atong mobile legend titser kay idol nako si zilong ( ga ngisi-ngisi)</p>	<p>(Now I understand the strategy for answering basic multiplication questions. I liked our teacher's Mobile Legends theme because I'm a big fan of Zilong!" (said with a smile).)</p>
<p><b>2.1. How do Base 10 blocks improve students' ability to solve multi step multiplication problems?</b></p>	
<p><b>Pupil # 1</b></p>	<p>( I can see the blocks that represent the numbers, so it's easy for me to understand the answer regardless of the multiplication expression )</p>

answer teacher.... tapos amo mang makita ang blocks tapos pwede Ra namo balikon ug ihap teacher	forgetting our answers, teacher, because we can see the blocks and re-count them.)
<b>Pupil # 4</b> Mag gamit mi ug blocks teacher Kay.. lipay kaayu mi ... Kay magunitan namo ang blocks tapos Dali Ra namo masabtan teacher Kay amo syang magunitan tapos ma lihok <sup>2</sup> namo Ang blocks tapos among answer teacher Kay amo ibutang sa papel teacher.	(We're using the blocks, teacher, because we're so happy to learn by using them. It's easy for us to understand, teacher, because we get to see the blocks, move them around, and write our answers on paper.)
<b>Pupil # 5</b> Ganahan mig base 10 blocks ug charts Kay kanang Kuan man Dali mi Maka sabot tapos ano sad sya ....kanang... nindot kaysa sa among lesson tea Kay mag bagit2 pami sa among papel di pariha sa blocks ug charts nga among syang eh lihok <sup>2</sup> tapos lingaw sad sya ihapon teacher Kay amo syag eh tudlo <sup>2</sup>	(We love using Base 10 blocks and charts, because it's really fun and easy to understand. It's even better than our usual lessons. We get excited moving the blocks and charts around on our paper, and it's fun too! It really helps us learn, teacher.)
<b>Pupil # 6</b> Nindot kaayu gamiton ang blocks ug ang charts ma'am Kay.. mag tabangay mi sa Akong ka grupo tapos... Dali rapud mi Maka solve ug multiply <sup>2</sup> teacher Kay amo rang ibutang sa box Ang blocks tapos mag ihap- ihap rami...	( I really appreciate using the blocks and charts, teacher. They're a huge help to my group and me. We can easily solve multiplication problems by placing the blocks in the box and counting them.)
<b>2.3. Do pupils show increased confidence in solving multiplication problems after using Base-10 Blocks? Why?</b>	
<b>Pupil # 1</b> Ganahan ko mogamit sa mga blocks kay makatabang sila nako mag-ihap ug dili malibog.	(I like using the blocks because they help me count and not get confused.)
<b>Pupil # 2:</b> Kuan... Malipay ko kung sakto akong tubag og ang mga blocks makatabang nako makakat-on hinay-hinay.	( I feel happy when I get the right answer. The blocks help me learn step by step.)
<b>Pupil # 3</b> Ang blocks nakatabang nako pagsabot sa kong asa dapit Ang multiplier ug multiplicand Karon, tapos ihapon dayun Kong pila kabuok Ang blocks para mahibal an Kong unsay answer.	( The blocks helped me understand where the multiplier and multiplicand are. Now, I just count how many blocks there are to find the answer.)
<b>Pupil # 4</b> Kung mogamit ko sa blocks, kahibalo ko unsa akong buhaton. Malipay ko kay makuha nako ang sakto nga tubag.	(When I use the blocks, I know what to do. I feel happy because I can get the right answer.)
<b>Pupil # 5</b> Sauna, lisudan ko sa multiplication, pero karon lingaw na! Ang blocks nakatabang sa ako pag-solve.	(Before, I found multiplication difficult, but now it's fun! The blocks helped me solve problems.)

APPENDIX 5

**MONCAST** **RDEO**

MINUTES

Code: AR2025-18 Date: \_\_\_\_\_

Members: \_\_\_\_\_

Title: Manipulative Paper - 10 Blocks

- Results of the RQ1
- Work with the papers and presentation
  - See the manuscript of Sir Uengie

Sir Manolong

- List of Tables, figures, and table of contents
- Theory: put the discussion of the theory
  - ↳ there is a significant difference.
- Tables on the top - Figures on the bottom
- Data gathering method instruction
  - \* Use only school
- Transitional statements
  - \* Implications
- Core ideas must be "general thought"
  - \* Reference
- The bullets must be erased.
- No contractions
- Key findings must be in the
- Reflection must focus on the RQ's.

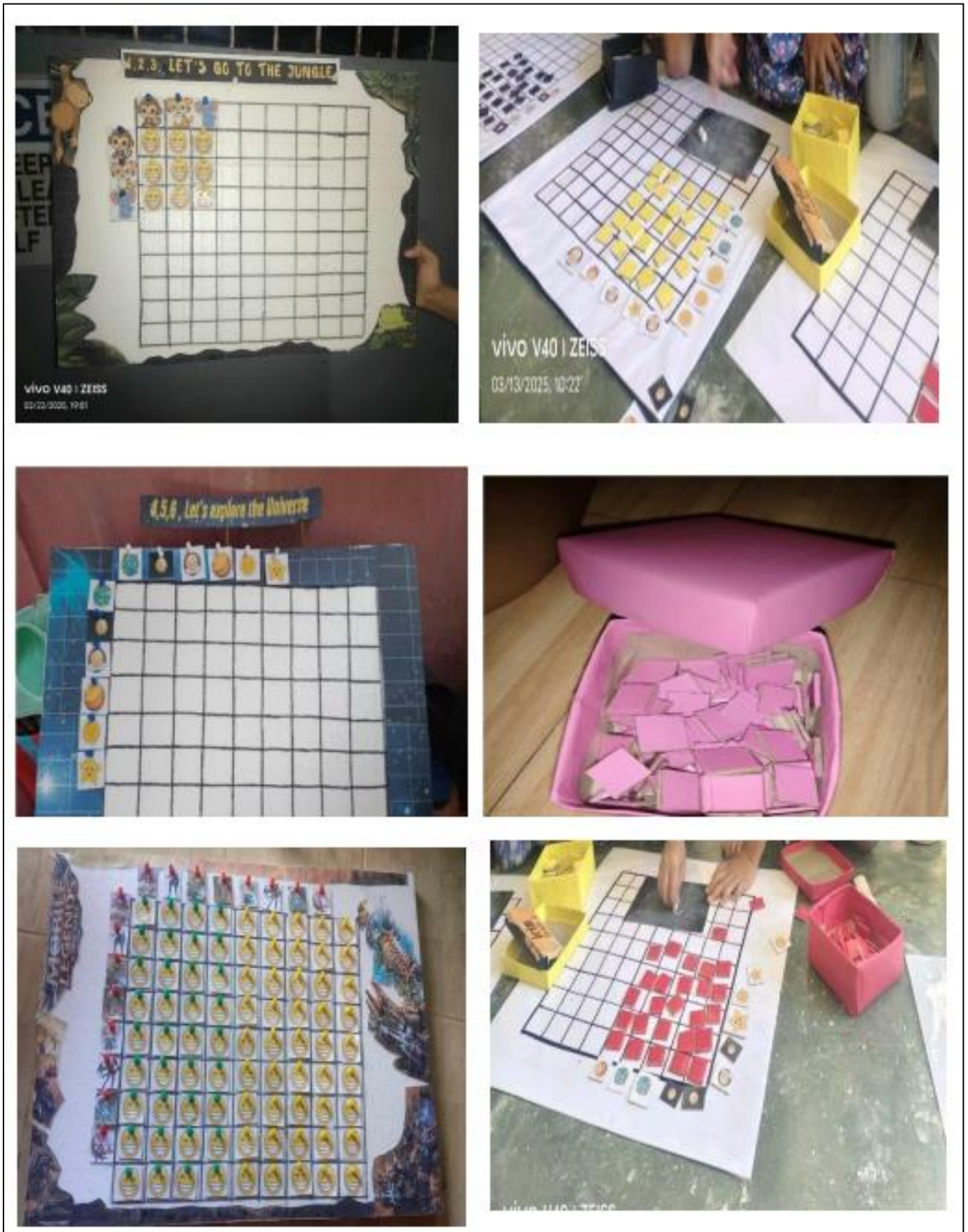
Research

ALLIUM Accredited

Address: Park 8, Palawan, Marikina City 1800  
 Email: igu@moncastdigital.com | Telephone No: 0962431188

+123-456-7890 | rdeo.moncast@gmail.com | Moncast Research, Development and Extension Office

APPENDIX 6



**APPENDIX 7**

