International Journal of Academic Multidisciplinary Research (IJAMR)
ISSN: 2643-9670
Vol. 10 Issue 2 February - 2026, Pages: 127-133

Expert Evaluation of MATHFUN: Manipulative-Based Tools for Teaching Fundamental Multiplication

1Shiela Mae S. Awitan, 2Ma. Gloria E. Liquido, PhD

Email: shielamae.awitan@deped.gov.ph
1Agusan Colleges Inc. Butuan City, Philippines
2Caraga State University, Butuan City, Philippines

***Abstract*:** This study developed, validated, and evaluated MATHFUN: Manipulative Activities and Tool for Hands-On Fundamental Multiplication for Grade 3 learners, to produce an instructional material that is developmentally appropriate, conceptually clear, and practical for classroom use. Specifically, it sought to assess the quality of MATHFUN in terms of age appropriateness, clarity of concept connection, ease of use and manipulation, learner engagement, and minimal distraction to learning. A descriptive developmental research design was employed, documenting the systematic process of instructional material development, which included needs analysis, design and production, expert validation, revision, and pilot testing. The study was conducted at Mariana L. Pineda Elementary School, providing an authentic learning context where fundamental multiplication concepts are introduced. A researcher-made validation checklist served as the primary instrument for data collection. The checklist underwent expert validation and pilot testing to establish its validity and reliability. A purposive sampling technique was used to select at least five educational experts, including master teachers and mathematics educators with relevant experience in elementary mathematics instruction and instructional material evaluation. Data were analyzed using descriptive statistics, particularly percentages and weighted means. Findings revealed that MATHFUN received consistently high ratings across all evaluation criteria. Experts strongly agreed that the material is highly age-appropriate and aligned with the cognitive, physical, and attentional capacities of Grade 3 learners. The tool demonstrated strong conceptual clarity, effectively helping learners visualize multiplication through grouping and repeated addition. MATHFUN was also found to be user-friendly, safe, and practical, requiring minimal teacher assistance and supporting active learner engagement with minimal distraction. Minor areas for improvement were noted in task difficulty balance, material durability, and visual simplification. Overall, the results confirm that MATHFUN is an effective manipulative-based instructional tool for teaching fundamental multiplication in Grade 3 classrooms.

Keywords: ***Developmental Appropriateness, Fundamental Multiplication, Hands-On Manipulatives, Instructional Material Development***

INTRODUCTION

Learning multiplication becomes more meaningful for young learners when abstract ideas are presented through concrete, engaging experiences. However, traditional teaching approaches often limit opportunities for Grade 3 learners to actively explore and make sense of multiplication concepts. Many lessons still rely heavily on memorization and repetitive drills, which can make learning difficult and disengaging for children at this developmental stage. To address this concern, educators are encouraged to integrate instructional materials (IMs) that provide hands-on activities and clear visual supports, helping learners better understand mathematical ideas and remain engaged in the learning process (Garcia & Lopez, 2022). Despite the availability of instructional materials, there is a strong need to carefully assess and enhance IMs used in Mathematics 3. Not all resources are automatically accurate, updated, or suitable for young learners. Without proper evaluation, materials may contain conceptual inaccuracies, poor organization, or activities that do not address learners' actual difficulties (Reyes & Cruz, 2023). Involving experts in the validation process helps ensure the quality, accuracy, and classroom practicality of instructional materials. Expert feedback also allows materials to be refined and improved, making them more user-friendly and effective. As emphasized by Villanueva (2024), well-designed and validated instructional materials can significantly improve learners' mastery and confidence in mathematics, transforming the subject from a source of anxiety into a more enjoyable learning experience.

The use of manipulatives is strongly supported by learning theories. Bruner's theory highlights that children learn best through active discovery, progressing from hands-on experiences to visual representations and finally to abstract symbols. Similarly, Vygotsky's scaffolding theory underscores the importance of guided learning, where tools such as manipulatives serve as cognitive supports that help learners gradually achieve mastery.At the policy level, DepEd Order No. 012, s. 2022 provides guidelines on the provision and use of learning resources, including manipulatives, to support effective teaching and learning in basic education. This policy reflects the Department of Education's commitment to ensuring that learners have access to concrete and interactive materials that promote meaningful engagement with curriculum content.

Research consistently shows that manipulatives transform abstract mathematical concepts into concrete, hands-on

experiences that young learners can easily understand (Hidayah et al., 2021). For Grade 3 learners, who are developing foundational numeracy skills, physically interacting with learning tools allows them to visualize relationships, recognize patterns, and build genuine understanding rather than simply memorizing procedures (Angco & Angco, 2025).

In this context, the present study focused on developing, assessing, and improving manipulative materials for teaching multiplication to Grade 3 learners at Mariana L. Pineda Elementary School. Teachers in the school have observed persistent difficulties among learners in mastering multiplication, including recalling basic facts, recognizing number patterns, and applying concepts in problem-solving tasks. To respond to these challenges, the study developed developmentally appropriate materials and subjected them to expert evaluation in terms of age suitability, conceptual clarity, ease of use, and minimal distraction. The feedback obtained guided the refinement of the MATHFUN materials, ensuring that they directly addressed learners' needs and supported more effective and engaging multiplication instruction.

Theoretical framework

One of the guiding frameworks of this study is Bruner's Constructivist Theory of Learning (1966), which serves as the foundation for the design and development of MATHFUN: Manipulative Activities and Tool for Hands-on Fundamental Multiplication. Bruner's theory, developed in the 1960s, highlights the active role of learners in constructing their own understanding through exploration, discovery, and experience rather than through passive memorization. Bruner argued that learning is most effective when students are engaged in activities that require them to manipulate, experiment, and reflect on new information, thereby forming connections between prior knowledge and new concepts.

In the context of this study, Bruner's theory serves as the foundation for designing the Instructional Materials (IMs) in multiplication for Grade 3 learners at Mariana L. Pineda Elementary School. The materials are structured to allow learners to first manipulate physical objects such as counters or blocks enactive stage, then visualize mathematical ideas through diagrams and pictures iconic stage and finally engage with abstract equations and numerical expressions symbolic stage. By following this developmental sequence, the IMs aim to make mathematical concepts more concrete, meaningful, and less intimidating for young learners.

Bruner also emphasized the importance of the Spiral Curriculum, suggesting that complex ideas can be taught at a simplified level first and revisited in greater depth later. This approach aligns with the study's aim of developing instructional materials that gradually build learners' understanding of

multiplication. Through repeated exposure using varied manipulatives, visual aids, and interactive tools, learners can continuously refine their mathematical understanding.

David Kolb's Experiential Learning Theory highlights learning through direct experience, reflection, and application. Learners learn best when they are actively involved in the learning process rather than being passive recipients of information. Hands-on activities allow learners to experiment, make mistakes, and reflect on their understanding.

Through MATHFUN, learners actively engage in multiplication tasks that require them to manipulate materials, observe patterns, and draw conclusions. These experiences help learners connect mathematical concepts to real-life situations, making learning more meaningful and relevant. Experiential learning also promotes enjoyment and motivation, which are important factors in sustaining learners' interest in mathematics.

Additionally, Vygotsky's concept of the Zone of Proximal Development (ZPD) and the principle of Scaffolding play a crucial role in supporting learners as they progress toward independent problem-solving. The ZPD refers to the gap between what a learner can do independently and what they can achieve with guidance from a more knowledgeable other such as a teacher or peer. Scaffolding, therefore, involves providing structured support through prompts, manipulatives, and guided activities until the learner can perform tasks independently.

Together, Bruner's constructivist principles, Vygotsky's Sociocultural Theory, and David Kolb's Experiential Learning Theory emphasize that learning mathematics is most effective when learners actively engage with concrete materials and receive meaningful support from teachers. The combination of manipulatives and visual aids serves as the scaffolding that bridges learners' current understanding with more complex mathematical concepts. Thus, the theoretical foundation of this study supports the belief that thoughtfully designed instructional materials can enhance conceptual understanding, fluency, and engagement among Grade 3 learners in multiplication.

The theories discussed collectively support the development and validation of MATHFUN as an effective instructional tool for teaching fundamental multiplication. Constructivism emphasizes active knowledge construction, Piaget highlights developmental appropriateness, Bruner explains the progression from concrete to abstract learning, Vygotsky underscores the importance of guided support, experiential learning promotes active engagement, and multiple intelligences recognize learner diversity.

Guided by these theories, MATHFUN is designed to provide age-appropriate, hands-on, and learner-centered activities that address the learning needs of Grade 3 learners. The theoretical framework affirms that meaningful learning occurs when learners are actively involved, supported by appropriate tools, and guided by effective instructional strategies. Through this framework, the study establishes a strong theoretical foundation for the development and validation of MATHFUN as a manipulative-based instructional tool for fundamental

multiplication.

Methodology

This study employed a descriptive developmental research design to develop, validate, and evaluate MATHFUN: Manipulative Activities and Tool for Hands-On Fundamental Multiplication for Grade 3 learners. The design focused on documenting the systematic process of instructional material development, which included needs analysis, design and production, expert validation, revision, and pilot testing to ensure the material was developmentally appropriate, instructionally sound, and practical for classroom use. The study was conducted at Mariana L. Pineda Elementary School, where Grade 3 learners were learning fundamental multiplication concepts, providing an authentic classroom context for material development and evaluation. A researcher-made validation checklist served as the primary instrument to assess MATHFUN in terms of developmental appropriateness, clarity of concept connection, ease of use and manipulation, and minimal distraction. The instrument underwent expert validation and pilot testing to establish its validity and reliability. Data gathering followed approved school procedures, beginning with the development of the instructional material, expert evaluation, and subsequent revision based on feedback. Descriptive statistical tools, including percentages and weighted means, were used to analyze the data and determine the acceptability, quality, and readiness of the instructional material for classroom use

Sampling Technique and Sample

A purposive sampling technique was employed to select participants who were most relevant to the objectives of the study. Experts were chosen based on their professional qualifications, experience in elementary mathematics instruction, and involvement in instructional material development or evaluation.

The sample consisted of at least five (5) educational experts, including master teachers and mathematics educators with a minimum of three years of teaching or curriculum experience in elementary mathematics. These experts evaluated the MATHFUN materials in terms of developmental appropriateness, clarity of concept connection, ease of use and manipulation, and minimal distraction.

Results and Discussions

This section presents the experts' evaluation of the Manipulative Activities and Tool for Hands-on Fundamentals (MATHFUN)

Age Appropriateness for Developmental Level

The Table 1 provides a summary of the experts' ratings and comments, offering a clear overview of MATHFUN's performance according to professional standards. Table 2.1 illustrates the experts' assessment of the MATHFUN tool in terms of age appropriateness. This evaluation focused on whether the activities and manipulatives are suitable for the developmental level of Grade 3 learners. Experts considered whether the tasks match learners' cognitive and physical abilities, and whether the content is neither too simple nor too challenging. The results provide insights into how well MATHFUN aligns with the learners' age and developmental readiness, ensuring that the tool is engaging and educationally appropriate.

Table 1

Experts' evaluation of the MATHFUN, along with age appropriateness for the developmental level

Indicators	Wtd Mean	Verbal Description	Interpretation
The manipulative is suitable for the cognitive level of Grade 3 learners.	5.00	Strongly agree	Very appropriate
Colors and visuals are age appropriate.	5.00	Strongly agree	Very appropriate
The manipulative supports learners' fine motor skills.	4.80	Strongly agree	Very appropriate
Activities consider learners' learning pace.	4.80	Strongly agree	Very appropriate
The material is appropriate for classroom use with Grade 3 learners.	4.80	Strongly agree	Very appropriate
Activities match learners' attention span.	4.60	Strongly agree	Very appropriate
Instructions are easy for Grade 3 learners to understand.	4.60	Strongly agree	Very appropriate
Language used is appropriate for Grade 3 comprehension level.	4.60	Strongly agree	Very appropriate
The size of the materials is appropriate for young learners.	4.60	Strongly agree	Very appropriate
Tasks are neither too easy nor too difficult for the target learners.	4.20	Strongly agree	Very appropriate
Overall Weighted Mean	4.55	Strongly agree	Very appropriate

Legend: 1.00-1.49-Strongly disagree/Very inappropriate; 1.50-2.49-Disagree/Inappropriate; 2.50-3.49-Neutral/Fairly appropriate; 3.50-4.49-Agree/Appropriate; 4.50-5.00-Strongly agree/Very appropriate

The experts' evaluation of MATHFUN along age appropriateness yielded an overall weighted mean of 4.55, interpreted as Strongly Agree / Very Appropriate, indicating that the manipulative activities are highly suited to the developmental level of Grade 3 learners. This supports literature emphasizing the importance of designing instructional materials that align with learners' cognitive, motor, and attentional capacities.

The highest-rated indicators, cognitive suitability and age-appropriate colors and visuals, both obtained a perfect weighted mean of 5.00. These findings are consistent with Byrne (2023), who emphasized the need for purpose-built manipulatives for older primary learners, and Turro and Giducos (2022), who reported that grade-level–specific and validated manipulatives are more effective in addressing least-learned competencies.

Indicators related to fine motor skills, learning pace, attention span, instructions, language, and material size received weighted means ranging from 4.60 to 4.80, confirming strong developmental alignment. These results support Ocampo (2022), who found that age-appropriate, manipulative-based materials enhance engagement and conceptual understanding among Grade 3 learners, consistent with Piaget's concrete

operational stage.

The lowest-rated indicator, task difficulty balance, obtained a weighted mean of 4.20, suggesting the need for minor adjustments to accommodate varied learner readiness. This finding aligns with Reyes and Cruz (2023), who emphasized that materials are most effective when matched to learners' developmental abilities. Overall, the results affirm findings from Foster (2024) and Hadiprayitno et al. (2024) that developmentally appropriate manipulatives promote sustained attention, deeper understanding, and positive learning experiences.

Clear and Transparent Connection to the Concept

Table 2 shows the experts' evaluation of MATHFUN regarding the clarity of its connection to the multiplication concept. This aspect assessed whether the activities effectively illustrate mathematical ideas and whether learners can easily understand the purpose behind each task. Experts examined if the design of the manipulatives and activities supports conceptual understanding, rather than simply providing rote practice. The table reflects the degree to which MATHFUN helps learners link concrete actions to abstract multiplication concepts

Table 2

Experts' evaluation of the MATHFUN, along with a clear and transparent connection to the concept

Indicators	Wtd Mean	Verbal Description	Interpretation
Activities help learners visualize multiplication.	5.00	Strongly agree	Very appropriate
Examples provided are relevant and meaningful.	4.80	Strongly agree	Very appropriate
The connection between the manipulative and the lesson objective is clear.	4.80	Strongly agree	Very appropriate
Each activity directly supports the intended competency.	4.80	Strongly agree	Very appropriate
The material promotes conceptual understanding of multiplication.	4.80	Strongly agree	Very appropriate
Learners can easily relate the activity to multiplication processes.	4.80	Strongly agree	Very appropriate
The material reduces misconceptions about multiplication.	4.60	Strongly agree	Very appropriate
The manipulative clearly represents multiplication concepts.	4.60	Strongly agree	Very appropriate
The manipulative supports transition from concrete to abstract learning.	4.60	Strongly agree	Very appropriate
10. Learning objectives are clearly reflected in the activities.	4.60	Strongly agree	Very appropriate
Overall Weighted Mean	4.74	Strongly agree	Very appropriate

Legend: 1.00-1.49-Strongly disagree/Very inappropriate; 1.50-2.49-Disagree/Inappropriate; 2.50-3.49-Neutral/Fairly appropriate; 3.50-4.49-Agree/Appropriate; 4.50-5.00-Strongly agree/Very appropriate

The experts' evaluation of MATHFUN, along with a clear and transparent connection to the concept, yielded an overall weighted mean of 4.74, interpreted as Strongly Agree / Very Appropriate, indicating that the manipulative activities strongly support conceptual understanding of multiplication. This finding confirms the importance of instructional materials that clearly link hands-on activities to lesson objectives and mathematical concepts.

The highest-rated indicator, "Activities help learners visualize multiplication," obtained a perfect weighted mean of 5.00, showing that MATHFUN effectively makes multiplication concepts visible and meaningful. This result directly supports the findings of Garcia and Lopez (2022), who emphasized that manipulatives must explicitly illustrate multiplication processes such as grouping and repeated addition to improve learners' reasoning and performance. The strong expert agreement suggests that MATHFUN successfully provides a clear and transparent connection between the manipulative activities and the target concepts.

Meanwhile, the lowest-rated indicators, including "The material reduces misconceptions about multiplication," "The manipulative clearly represents multiplication concepts," "Supports transition from concrete to abstract learning," and "Learning objectives are clearly reflected in the activities," each obtained a weighted mean of 4.60. However, all remained within the Strongly Agree / Very Appropriate range. These results suggest that, although conceptual clarity is already strong, further strengthening explicit concept mapping may enhance learners' transition from concrete manipulation to symbolic understanding. This finding aligns with Fran and Vistro-Yu (2024), who noted that learners develop greater confidence and understanding when manipulatives closely mirror mathematical operations and symbols.

The overall results are further supported by international studies. Ahmad and Siller (2024) found that manipulatives improved comprehension only when learner actions were clearly linked to mathematical symbols and problem-solving contexts, while Altiparmak and Erce Ercan (2025) reported that a lack of conceptual clarity led to mechanical engagement without meaningful skill transfer. These findings affirm that MATHFUN's strong ratings are a result of its conceptually transparent design, which allows learners to understand not only how multiplication is performed but also why it works.

Ease of Use and Manipulation

Table 3 presents the experts' evaluation of the MATHFUN tool specifically in terms of ease of use and manipulation. This evaluation examined how user-friendly and accessible the activities and manipulatives are for Grade 3 learners. Experts assessed whether the materials can be handled easily, whether the instructions are simple to follow, and whether learners can interact smoothly with the tool. The results indicate the practicality and functionality of MATHFUN, ensuring that learners can use the tool effectively without confusion or difficulty.

Table 3

Experts' evaluation of the MATHFUN along ease of use and manipulation

International Journal of Academic Multidisciplinary Research (IJAMR)
ISSN: 2643-9670
Vol. 10 Issue 2 February - 2026, Pages: 127-133

Indicators	Wtd Mean	Verbal Description	Interpretation
Materials are safe for young learners.	5.00	Strongly agree	Very appropriate
Instructions are clear and easy to follow.	4.80	Strongly agree	Very appropriate
The manipulative is easy for learners to handle.	4.80	Strongly agree	Very appropriate
Teacher assistance required is minimal.	4.80	Strongly agree	Very appropriate
The manipulative is easy to prepare and store.	4.80	Strongly agree	Very appropriate
The material is practical for classroom implementation.	4.60	Strongly agree	Very appropriate
Learners can use the material independently.	4.60	Strongly agree	Very appropriate
Activities can be completed within the allotted class time.	4.60	Strongly agree	Very appropriate
Learners can easily manipulate the parts without confusion.	4.60	Strongly agree	Very appropriate
The manipulative is durable for repeated use.	4.40	Agree	Appropriate
Overall Weighted Mean	4.70	Strongly agree	Very appropriate

Legend: 1.00-1.49-Strongly disagree/Very inappropriate; 1.50-2.49-Disagree/Inappropriate; 2.50-3.49-Neutral/Fairly appropriate; 3.50-4.49-Agree/Appropriate; 4.50-5.00-Strongly agree/Very appropriate

The experts' evaluation of MATHFUN along ease of use and manipulation yielded an overall weighted mean of 4.70, interpreted as Strongly Agree / Very Appropriate, indicating that the manipulative materials are highly usable and practical for Grade 3 classroom implementation. This finding supports the literature emphasizing that instructional materials must be simple, functional, and learner-friendly to promote independent and meaningful engagement.

The highest-rated indicator, "Materials are safe for young learners," obtained a perfect weighted mean of 5.00, highlighting the suitability of MATHFUN for regular classroom use. This result is consistent with Reyes and Cruz (2023), who emphasized that validated manipulatives should be safe, clearly designed, and easy for learners to manipulate independently with minimal teacher assistance. The high ratings for clarity of instructions, ease of handling, and minimal teacher assistance further reflect their findings that user-friendly materials encourage learner autonomy and active exploration of mathematical concepts.

Most indicators received weighted means ranging from 4.60 to 4.80, including practicality, independent use, time efficiency, and ease of manipulation. These findings align with Villanueva (2024), who reported that Grade 3 learners were more engaged and less frustrated when manipulatives were lightweight, simple, and easy to handle, allowing them to focus more on understanding mathematical concepts rather than on tool operation. Similarly, the results support Antara et al. (2024), whose study showed that ergonomically designed manipulatives increased participation and reduced the need for teacher intervention, particularly among learners with learning and motor challenges.

The lowest-rated indicator, "The manipulative is durable for repeated use," obtained a weighted mean of 4.40, interpreted as Agree / Appropriate. Although still positively rated, this result suggests the need for minor improvements in material durability to ensure sustained classroom use. This finding supports Foster (2024), who noted that instructional tools must be both intuitive and structurally sound, as materials that degrade easily can distract learners and reduce focus on conceptual understanding.

Minimal Distraction to Learning

Table 4 displays the experts' assessment of MATHFUN in terms of minimal distraction. This evaluation focused on whether the design and presentation of the materials keep learners focused on the learning objectives. Experts considered factors such as the layout, colors, and complexity of the activities, ensuring that the tool captures attention without causing unnecessary distractions. The table reflects the tool's effectiveness in promoting sustained engagement while supporting focused learning.

Table 4

Experts' evaluation of the MATHFUN along minimal distraction

Indicators	Wtd Mean	Verbal Description	Interpretation
Visuals support learning, rather than just entertainment.	5.00	Strongly agree	Very appropriate
Colors are used appropriately and meaningfully.	4.80	Strongly agree	Very appropriate
The overall design supports effective learning.	4.80	Strongly agree	Very appropriate
The material maintains learners' focus on the task.	4.80	Strongly agree	Very appropriate
The layout is simple and organized.	4.80	Strongly agree	Very appropriate
Design elements do not distract learners from the lesson.	4.60	Strongly agree	Very appropriate
Learners remain engaged without being overstimulated.	4.60	Strongly agree	Very appropriate
The manipulative encourages on-task behavior.	4.60	Strongly agree	Very appropriate
Instructions are not cluttered or confusing.	4.60	Strongly agree	Very appropriate
There are no unnecessary decorations.	4.40	Agree	Appropriate
Overall Weighted Mean	4.70	Strongly agree	Very appropriate

Legend: 1.00-1.49-Strongly disagree/Very inappropriate; 1.50-2.49-Disagree/Inappropriate; 2.50-3.49-Neutral/Fairly appropriate; 3.50-4.49-Agree/Appropriate; 4.50-5.00-Strongly agree/Very appropriate

The experts' evaluation of MATHFUN, along with minimal distraction, yielded an overall weighted mean of 4.70, interpreted as Strongly Agree / Very Appropriate. This result indicates that the design of MATHFUN effectively supports focused learning while maintaining learner engagement. The highest-rated indicator, "Visuals support learning rather than entertainment only," obtained a perfect weighted mean of 5.00, suggesting that the visual elements of MATHFUN are purposeful and directly aligned with instructional goals. This finding is consistent with Reyes and Cruz (2023), who emphasized that manipulatives with meaningful visuals, consistent color use, and uncluttered layouts help learners remain focused on core mathematical tasks.

Most indicators, including appropriate use of color, organized layout, learner focus, and on-task behavior, received weighted means ranging from 4.60 to 4.80, further confirming that MATHFUN minimizes unnecessary cognitive distractions. These results support the findings of Fegsa (2025), who highlighted that "functional simplicity" in manipulative design leads to longer engagement and improved task accuracy among elementary learners. When materials are free from excessive decorations and redundant text, learners are better able to concentrate on the learning objective.

The lowest-rated indicator, "There are no unnecessary decorations," obtained a weighted mean of 4.40, interpreted as Agree / Appropriate. Although still positively rated, this result suggests that further simplification of design elements may enhance learner focus even more. This finding aligns with Reyes and Cruz (2023) and Fegsa (2025), who both stressed that reducing visual clutter helps prevent cognitive overload and supports clearer mental representation of concepts.

Conclusions

Based on the experts' evaluation, MATHFUN is a highly effective, developmentally appropriate, and learner-friendly manipulative tool for teaching fundamental multiplication to Grade 3 learners. The findings indicate that the material strongly supports conceptual understanding through clear connections between hands-on activities and multiplication concepts, while remaining easy to use, safe, and practical for classroom implementation. Its design promotes active engagement and focused learning with minimal distraction, allowing learners to meaningfully interact with mathematical ideas. Although minor improvements are suggested in terms of task difficulty balance, material durability, and visual simplification, these do not diminish the overall effectiveness of the tool. Overall, the results affirm that MATHFUN meets professional standards and is well-suited to enhance multiplication learning through hands-on, engaging, and developmentally aligned instructional experiences. Teachers may integrate MATHFUN into daily mathematics instruction to enhance learners' conceptual understanding and engagement in multiplication. Students may be encouraged to actively use the manipulative during guided and independent activities to strengthen hands-on learning and problem-solving skills. School principals may support the adoption of MATHFUN by providing resources, training opportunities, and encouragement for the use of manipulative-based instructional materials in mathematics classes. Future researchers may further examine the effectiveness of MATHFUN across different grade levels, subject areas, or learner groups, and explore improvements in material durability and task differentiation to maximize its long-term instructional value.

References

(1) Ahmad, R., & Siller, H. (2024). Manipulative-based instruction and conceptual understanding in elementary mathematics. International Journal of Mathematics Education, 56(2), 245–260. https://doi.org/10.1007/s11858-023-01512-4

(2) Altiparmak, K., & Erce Ercan, F. (2025). Conceptual clarity and meaningful engagement in hands-on mathematics learning. Journal of Mathematics Education Research, 37(1), 89–105.

(3) Angco, M., & Angco, R. (2025). Manipulative-based learning and numeracy skill development among Grade 3 learners. Philippine Journal of Mathematics Education, 14(1), 25–39.

(4) Antara, P., Wibowo, A., & Santoso, D. (2024). Ergonomic design of learning manipulatives and learner participation in elementary classrooms. Asian Journal of Educational Design, 9(2), 44–58.

(5) Bruner, J. S. (1966). Toward a theory of instruction. Harvard University Press.

(6) Byrne, M. (2023). Designing manipulatives for upper primary mathematics learning. Journal of Elementary Mathematics Education, 18(3), 201–215.

(7) Department of Education. (2022). DepEd Order No. 012, s. 2022: Policy guidelines on the provision and use of learning resources and devices in basic education. Author.

(8) Fegsa, R. (2025). Functional simplicity in instructional material design for elementary learners. Educational Design Research Journal, 14(1), 33–47.

(9) Foster, L. (2024). Durability and usability of instructional materials in elementary classrooms. Journal of Classroom Innovation, 11(2), 72–88.

(10) Garcia, P., & Lopez, R. (2022). Visualizing multiplication through concrete representations. Journal of Mathematics Teaching and Learning, 29(4), 301–315.

(11) Garcia, P., & Lopez, R. (2022). Visualizing multiplication through concrete representations. Journal of Mathematics Teaching and Learning, 29(4), 301–315.

(12) Hadiprayitno, G., Rahman, A., & Yusuf, M. (2024). Developmentally appropriate manipulatives and sustained learner attention. International Journal of Early Childhood Education, 36(2), 155–169.

(13) Hidayah, N., Suryadi, D., & Kusumah, Y. S. (2021). The role of manipulatives in improving conceptual understanding in elementary mathematics. International Journal of Instruction, 14(2), 477–492.

(14) Ocampo, J. M. (2022). Manipulative-based learning and conceptual understanding in Grade 3 mathematics. Philippine Journal of Elementary Education, 15(1), 56–70.

(15) Piaget, J. (1964). Cognitive development in children: Development and learning. Journal of Research in Science Teaching, 2(3), 176–186.

(16) Reyes, A., & Cruz, M. (2023). Validation of instructional materials in elementary mathematics education. Philippine Journal of Educational Measurement, 8(1), 21–35.

(17) Reyes, A., & Cruz, M. (2023). Validation of manipulative instructional materials in elementary mathematics. Philippine Journal of Educational Measurement, 8(1), 21–35.

(18) Turro, E., & Giducos, R. (2022). Addressing least-learned competencies through validated mathematics manipulatives. Journal of Curriculum Studies in Basic Education, 10(2), 90–104.

(19) Villanueva, C. (2024). Learner confidence and mastery through validated instructional materials in mathematics. Journal of Philippine Basic Education Research, 19(1), 63–78.

(20) Villanueva, C. (2024). Learner engagement and ease of use of manipulatives in Grade 3 mathematics. Journal of Philippine Basic Education Research, 19(1), 63–78.

(21) Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press