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Experiential Teaching-Learning Manipulatives Strategy in Mathematics for Grade 1 Learners

Vivienne Decery C. Bañola
Master of Arts in Education, Major in Administration and Supervision, Cebu Technological University - Main Campus, R. Palma St. , Cebu City, Philippines

Email of Corresponding Author: viviennedecery.cinco@deped.gov.ph

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Abstract

This study examined the effectiveness of a manipulative teaching-learning strategy in improving the Mathematics performance of Grade 1 learners at Atipolo Elementary School, Tanauan II District, Leyte, during School Year 2026–2027, as a basis for developing manipulative-oriented learning exercises. Anchored on experiential and constructivist learning theories, the study employed a quantitative, one-group pretest–posttest pre-experimental design involving 14 learners selected through total enumeration. Data were collected using a researcher-prepared 60-item Mathematics achievement test covering repeating patterns, ordering numbers up to 100, and comparing numbers up to 20. Descriptive statistics and paired-samples t-tests were used to analyze performance differences. Results revealed that the overall mean score increased from 50.70 (85% mean percentage score), interpreted as Moving Towards Mastery, to 59.00 (98%), interpreted as Mastered. The mean gain of 8.30 points was statistically significant ($t = 12.093$, $p < .001$), with significant improvements across all three competencies. Number patterns and descending numerical ordering, initially identified as relatively weaker areas, also attained mastery. Based on these findings, nine contextualized manipulative-oriented learning exercises were proposed to reinforce and enrich foundational numeracy. The study recommends integrating manipulative-based activities into Mathematics instruction, validating the proposed exercises, and conducting further investigations using larger samples and comparison groups. However, the absence of a control group limits causal interpretation and generalizability. The study supports Sustainable Development Goal 4 (Quality Education) by promoting developmentally appropriate strategies for improving foundational mathematical competencies. Its sustainability contribution lies in supporting continuous instructional improvement through accessible, locally contextualized learning materials that may strengthen classroom practices and institutional capacity for early numeracy development.

Keywords: Experiential Learning; Foundational Numeracy; Grade 1 Mathematics; Manipulative-Oriented Learning Exercises; Manipulative Teaching-Learning Strategy; Mathematics Performance; Pretest–Posttest Design

1. Introduction

Foundational Mathematics education is essential for developing numeracy, logical reasoning, and problem-solving skills among young learners. In Grade 1, concrete and experiential learning experiences help children understand mathematical concepts before progressing to abstract representations. This study examined the effectiveness of a manipulative teaching-learning strategy in improving Grade 1 learners' performance in repeating patterns, ordering numbers, and comparing numbers at Atipolo Elementary School, Tanauan II District,

Leyte, during School Year 2026–2027. The findings were intended to provide a basis for developing manipulative-oriented learning exercises.

Mathematics develops essential competencies that support academic achievement and lifelong learning. Strong mathematical foundations in the early grades contribute to later proficiency, while difficulties in foundational numeracy may persist throughout schooling (UNESCO, 2022; OECD, 2023). Consequently, developmentally appropriate instructional approaches are necessary to strengthen mathematical understanding among Grade 1 learners. The Revised K to 10 Curriculum emphasizes learner-centered, contextualized, and competency-based instruction that encourages exploration, inquiry, and meaningful participation (Department of Education [DepEd], 2025). This direction is consistent with international recommendations promoting authentic learning experiences and active problem-solving (UNESCO, 2024). Manipulative-based instruction supports these priorities by allowing learners to explore mathematical relationships through concrete objects before using visual and numerical representations. Experiential learning provides opportunities for learners to manipulate materials, reflect on observations, develop concepts, and apply knowledge to mathematical situations (Kolb & Kolb, 2022). Such experiences are particularly appropriate for Grade 1 learners, who benefit from concrete activities before progressing toward abstract mathematical reasoning (National Council of Teachers of Mathematics [NCTM], 2023).

Research highlights the contribution of experiential learning to mathematical understanding, engagement, motivation, and retention. Active learning approaches enable learners to construct knowledge through meaningful experiences and improve their ability to apply mathematical concepts (Kolb & Kolb, 2022; OECD, 2023). The use of manipulatives has been associated with improved mathematical confidence, attitudes, and conceptual understanding, particularly when learners are guided from concrete activities toward abstract representations (Quane, 2025). In the Philippine context, Vendicacion et al. (2025) reported improvements in Grade 1 numeracy following manipulative-based arithmetic activities, while Guillermo (2025) identified positive contributions to mathematical achievement, confidence, and classroom participation. Contextualized instructional materials also support developmentally appropriate mathematics learning. Fegsa (2025) established the suitability of locally sourced manipulatives for foundational mathematical concepts, while Tagalog and Oco (2025) found improvements in classification, patterning, and numeracy through structured hands-on instruction. Similarly, Tamayo and Tallungan (2026) reported gains in Grade 1 number sense, motivation, and participation following manipulative-based activities. These findings support the use of concrete learning materials to strengthen early numeracy, particularly in competencies requiring learners to recognize patterns, establish numerical order, and compare quantities.

Improving foundational numeracy remains an international educational priority because early mathematical difficulties can affect subsequent learning. Assessment reports have identified continuing concerns regarding mathematical proficiency and numeracy development among Filipino learners (OECD, 2023; UNESCO, 2022). In response, Philippine educational reforms emphasize conceptual understanding, active participation, and appropriate instructional resources. The Revised K to 10 Curriculum promotes meaningful mathematical experiences that develop foundational competencies through exploration and problem-solving (DepEd, 2025). At Atipolo Elementary School in Tanauan II District, DepEd Schools Division of Leyte, the investigation focused on the performance of Grade 1 learners before and after manipulative-based instruction. The targeted competencies involved creating repeating patterns using objects, images, or numbers; ordering numbers up to 100 in ascending and descending order; and comparing numbers up to 20. Assessing these competencies provided localized classroom evidence to guide the development of supplementary mathematics exercises.

The study was primarily anchored on Kolb's Experiential Learning Theory (Kolb, 1984), which explains learning as a continuous process involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. Applied to Grade 1 Mathematics, this framework supports learners' engagement with manipulatives, reflection on mathematical relationships, formulation of concepts, and application of understanding to learning tasks. Bruner's Constructivist Theory of Learning (Bruner, 1966) further supports the progression from enactive to iconic and symbolic representations. Through this process, learners initially manipulate concrete materials, interpret visual representations, and eventually use mathematical symbols. This progression is consistent with research emphasizing guided transitions between concrete and abstract mathematical understanding (Quane, 2025). Dewey's Theory of Experiential Education (Dewey, 1938) likewise emphasizes meaningful experiences, inquiry, reflection, and problem-solving. Research supports the value of active participation, exploration, and collaborative learning in developing mathematical engagement and achievement (Liljedahl et al., 2023; Xu et al., 2023). These theoretical perspectives are supported by Republic Act No. 10533, which promotes learner-centered, contextualized, and developmentally appropriate education. The Revised K to 10 Curriculum (2025) reinforces foundational numeracy and competency-based instruction, while Recent scholarship on manipulative-based instruction emphasizes effective pedagogy and appropriate instructional resources (Angco & Angco, 2024; Fegsa, 2025). Collectively, these foundations justify the use of

manipulatives as instructional resources for strengthening mathematical understanding through concrete, visual, and symbolic learning experiences.

Although previous studies have demonstrated the educational value of manipulatives, localized evidence remains necessary to determine how Grade 1 learners perform in specific mathematical competencies before and after manipulative-based instruction. Existing literature supports experiential learning, but classroom-level assessment is essential for identifying competency-specific learning needs and informing appropriate reinforcement activities. This study addressed that need by examining pretest and posttest performance in repeating patterns, ordering numbers up to 100, and comparing numbers up to 20. It specifically determined whether a significant mean gain occurred between the two assessments, with the null hypothesis tested at the 0.05 level of significance. Rather than measuring teachers' reported use of experiential strategies, the investigation focused on changes in learners' achievement following the instructional intervention. Its findings were intended to guide the development of manipulative-oriented learning exercises responsive to identified mathematical learning needs.

The study aligns primarily with Sustainable Development Goal 4 (Quality Education), particularly its emphasis on inclusive, equitable, and effective learning opportunities. Strengthening foundational numeracy through developmentally appropriate instructional strategies supports the broader objective of improving learning outcomes in basic education. By assessing learners' performance in essential mathematical competencies and using the findings to develop supplementary exercises, the study contributes to efforts to improve the quality of early-grade instruction. Its emphasis on concrete, accessible, and contextualized learning materials is also consistent with the learner-centered priorities of the Philippine basic education curriculum.

The study contributes primarily to educational and institutional sustainability by providing classroom-based evidence that may support continued improvement in foundational Mathematics instruction. Its findings can guide teachers in selecting manipulative activities, identifying competencies requiring reinforcement, and designing learning exercises suited to Grade 1 learners. The proposed manipulative-oriented exercises may also support curriculum implementation, instructional supervision, teacher mentoring, and collaborative professional development. The use of accessible and locally contextualized materials offers a practical approach to maintaining developmentally appropriate learning activities within available school resources.

2. Material and methods

2.1 Research Design

The study employed a quantitative pre-experimental research design, specifically a one-group pretest–posttest design, to assess changes in Grade 1 learners' Mathematics performance following manipulative-based instruction. The same group of learners completed assessments before and after the intervention, without a separate control group. This design allowed the researcher to determine whether significant mean gains occurred, although alternative explanations for observed improvements could not be completely excluded. The study followed an Input–Process–Output framework. The input comprised learners' pretest performance in creating repeating patterns, ordering numbers up to 100, and comparing numbers up to 20. The process involved obtaining research permissions, administering the pretest, implementing manipulative-based instructional activities, conducting the posttest, and analyzing paired scores. The output consisted of proposed manipulative-oriented learning exercises developed from the findings to reinforce and enrich foundational Mathematics competencies.

2.2 Locale of the Study

The study was conducted at Atipolo Elementary School, Tanauan II District, DepEd Schools Division of Leyte, during School Year 2026–2027. The school provided an actual classroom environment for implementing manipulative-based Mathematics instruction. The setting allowed learners to engage in hands-on activities using concrete objects, visual representations, and developmentally appropriate learning materials while enabling the researcher to assess changes in mathematical performance under regular classroom conditions.

2.3 Respondents of the Study

The respondents were fourteen (14) Grade 1 learners from one intact class at Atipolo Elementary School. All participants underwent the manipulative teaching-learning intervention and completed both pretest and posttest assessments. The instructional activities focused on creating repeating patterns using objects, images, or numbers; ordering numbers up to 100 in ascending and descending order; and comparing numbers up to 20. The same learners participated throughout the intervention, allowing direct comparisons of individual performance before and after manipulative-based instruction.

2.4 Sample and Sampling Procedure

The study utilized total enumeration sampling, including all fourteen (14) Grade 1 learners in the identified class. This approach was appropriate because the class size was small and manageable, allowing the researcher to assess the entire group without selecting a smaller sample. No random selection or assignment to experimental and

control groups was undertaken. All participants completed the pretest, received the instructional intervention, and took the posttest. Their corresponding assessment scores were paired to determine mean gains and evaluate statistically significant differences.

2.5 Research Instrument

The study employed a researcher-prepared, 60-item multiple-choice Mathematics achievement test administered as both the pretest and posttest. The instrument covered three Grade 1 Mathematics competencies, with 20 items assigned to each. It incorporated numerical representations, colorful objects, shapes, number sequences, and familiar situations appropriate to the learners' developmental level. The first component assessed the creation of repeating patterns through 10 items on object and shape patterns, seven on number patterns, and three on creating and identifying repeating patterns. The second component evaluated ordering numbers up to 100 through 10 ascending-order items, eight descending-order items, and two manipulative-based ordering items. The third component consisted of 20 items assessing comparisons of numbers up to 20, including greater than, less than, and equal relationships using numerical and concrete representations. Each correct answer received one point, while an incorrect answer received zero. Each competency had a maximum score of 20 points, yielding a total possible score of 60. The same instrument was used for both assessments to ensure consistency in measuring changes in learners' mathematical performance.

2.6 Data Gathering Procedure

Data gathering began with securing permission from the concerned school authorities and coordinating the intervention schedule and assessment procedures. The researcher then administered the 60-item pretest to establish the learners' baseline performance in the three identified Mathematics competencies. Following the pretest, manipulative-based instructional activities were implemented using number cards, counters, bottle caps, colored shapes, counting sticks, number lines, and other developmentally appropriate materials. Learners identified, constructed, and extended repeating patterns; arranged numbers in ascending and descending order; and compared quantities to determine greater, smaller, or equal values. The activities emphasized guided exploration and progression from concrete experiences to pictorial and symbolic understanding. After the intervention, the same fourteen (14) learners completed the posttest using the identical assessment instrument. Their responses were checked, scored, organized by competency, and matched with corresponding pretest scores. The collected data were subsequently analyzed to determine learning gains and provide a basis for developing manipulative-oriented Mathematics exercises.

2.7 Data Analysis Techniques

The study employed descriptive and inferential statistical procedures to analyze learners' pretest and posttest performance. The mean, standard deviation, and mean percentage score (MPS) were used to describe achievement in each competency and the overall assessment. The MPS was calculated by dividing the raw score by the maximum possible score and multiplying by 100. Performance was interpreted using seven mastery classifications: 96–100% as Mastered, 86–95% as Closely Approximating Mastery, 66–85% as Moving Towards Mastery, 35–65% as Average Mastery, 15–34% as Low Mastery, 5–14% as Very Low Mastery, and 0–4% as Absolutely No Mastery. Mean gain was computed by subtracting the pretest mean from the posttest mean. The paired-samples t-test was applied separately to the three competencies and the combined 60-item assessment to determine whether the differences between pretest and posttest scores were statistically significant. The null hypothesis was tested at the 0.05 significance level, with a p-value below .05 indicating a statistically significant difference.

2.8 Ethical Considerations

The study observed ethical principles involving voluntary participation, informed consent, confidentiality, participant protection, and responsible data handling. Permission was obtained from the concerned school authorities, while informed consent was secured from parents or legal guardians because the participants were minors. Learners also received age-appropriate explanations of the activities, and their willingness to participate was respected. Parents or guardians were informed of their right to withdraw their children without adverse consequences. Instructional activities and assessments were conducted in a safe, developmentally appropriate, supportive, and nonthreatening classroom environment. Participant confidentiality was protected in accordance with Republic Act No. 10173, or the Data Privacy Act of 2012. Individual records were treated confidentially, learner identities were protected through appropriate identifiers, and findings were presented in summarized form. The researcher maintained objectivity and accuracy in recording, analyzing, and reporting the results.

3. Results and Discussion

3.1 Mathematics Performance of Grade 1 Learners Before the Use of Manipulatives

3.1.1 Pretest Performance in Creating Repeating Patterns

The learners obtained an average raw score of 17 out of 20 items, equivalent to a mean percentage score (MPS) of 85%, interpreted as Moving Towards Mastery. Object and shape patterns and repeating patterns each recorded 87% MPS, interpreted as Closely Approximating Mastery, while number patterns registered the lowest MPS of 81%, interpreted as Moving Towards Mastery. These findings indicate stronger initial performance in visual and concrete pattern recognition than in numerical sequencing. This is consistent with Zippert et al. (2020), who emphasized the relationship between early patterning skills and mathematical development. Baumanns et al. (2024) identified differences in learners' pattern-recognition strategies according to task complexity, while Grenell et al. (2025) highlighted the importance of varied patterning activities. Together, these studies support instructional progression from familiar object patterns to increasingly complex numerical sequences.

3.1.2 Pretest Performance in Ordering Numbers up to 100

The learners obtained an average raw score of 16.8 out of 20 items, corresponding to an MPS of 84%, interpreted as Moving Towards Mastery. Ascending numerical ordering recorded 86% MPS, interpreted as Closely Approximating Mastery, while descending ordering registered 81% and manipulative-based ordering obtained 85%, both interpreted as Moving Towards Mastery. The lower performance in descending ordering suggests a need for additional practice in numerical magnitude and flexible sequencing. Donovan and Fyfe (2022) emphasized the importance of connecting concrete representations with numerical symbols in developing place-value understanding. Similarly, Foulkes et al. (2023) highlighted the relevance of selecting appropriate concrete manipulatives for mathematical instruction. These findings support using structured materials and guided activities to strengthen ascending and descending numerical relationships.

3.1.3 Pretest Performance in Comparing Numbers up to 20

The learners recorded an average raw score of 16.9 out of 20 items, equivalent to an MPS of 85%, interpreted as Moving Towards Mastery. This indicated an established but not fully mastered understanding of numerical magnitude and greater-than, less-than, and equal-to relationships. The result suggests that learners may benefit from additional concrete comparison activities to reinforce numerical reasoning. Angco and Angco (2024) identified mathematical proficiency, engagement, motivation, resource accessibility, and teacher competency as important considerations in manipulative-based Mathematics instruction. Accordingly, structured activities involving counters, number cards, and other concrete materials may help strengthen number comparison and conceptual understanding.

3.2 Mathematics Performance of Grade 1 Learners After the Use of Manipulatives

3.2.1 Posttest Performance in Creating Repeating Patterns

Following the intervention, learners obtained an average raw score of 19.8 out of 20 items, equivalent to 99% MPS, interpreted as Mastered. Object and shape patterns and repeating patterns each attained 100% MPS, while number patterns reached 97%. The overall competency improved by 14 percentage points from its pretest MPS of 85%, with number patterns increasing by 16 percentage points from 81% to 97%. The improvement indicates stronger performance in recognizing, constructing, and extending mathematical patterns after manipulative-based instruction. Vendicacion et al. (2025) reported improvements in foundational numeracy following manipulative-based arithmetic instruction, while Zippert et al. (2021) emphasized the contribution of structured patterning activities to early mathematical learning. Zippert et al. (2020) further established the developmental importance of repeating-pattern knowledge. These findings support the instructional relevance of concrete patterning activities that connect observable arrangements with numerical relationships.

3.2.2 Posttest Performance in Ordering Numbers up to 100

The learners obtained an average raw score of 19.5 out of 20 items, equivalent to 97.5% MPS, interpreted as Mastered. Manipulative-based ordering attained 100% MPS, ascending ordering reached 98%, and descending ordering obtained 96%. Compared with the pretest MPS of 84%, the overall competency increased by 13.5 percentage points. Descending ordering improved from 81% to 96%, while ascending ordering increased from 86% to 98%. The results indicate improved proficiency in arranging numbers according to magnitude, including the previously weaker skill of descending ordering. Donovan and Fyfe (2022) demonstrated the importance of connecting concrete materials with numerical symbols in developing place-value understanding. The findings suggest that guided manipulation of quantities and numerical representations may support learners' understanding of ascending and descending sequences.

3.2.3 Posttest Performance in Comparing Numbers up to 20

The learners achieved an average raw score of 19.7 out of 20 items, equivalent to approximately 99% MPS, interpreted as Mastered. This represented an increase of 2.8 points from the pretest average of 16.9 and approximately 14 percentage points from the initial MPS of 85%. The improvement suggests stronger

understanding of numerical magnitude and comparison relationships following the instructional intervention. Angco and Angco (2024) emphasized the contribution of purposeful manipulative-based activities to mathematical proficiency and engagement. The findings support the use of concrete representations and guided mathematical explanations to reinforce learners' understanding of greater-than, less-than, and equal-to relationships.

3.3 Significant Differences Between Pretest and Posttest Mathematics Performance

3.3.1 Mean Gain in Creating Repeating Patterns

The mean score increased from 17.07 (SD = 1.07) during the pretest to 19.79 (SD = 0.43) during the posttest, producing a mean gain of 2.72 points. The paired-samples t-test indicated a statistically significant difference ($t = 10.212$, $p < .001$), resulting in the rejection of the null hypothesis at the 0.05 significance level. The significant improvement supports the potential instructional value of structured manipulative-based patterning activities. Zippert et al. (2021) demonstrated improvements in repeating-pattern knowledge through targeted instruction, while Zippert et al. (2020) emphasized the importance of early patterning skills in mathematical development. The reduced variability in posttest scores also suggests greater consistency in learners' demonstrated patterning performance.

3.3.2 Mean Gain in Ordering Numbers up to 100

The learners' mean score increased from 16.84 (SD = 1.60) to 19.50 (SD = 0.85), yielding a mean gain of 2.66 points. The difference was statistically significant ($t = 8.681$, $p < .001$), warranting rejection of the null hypothesis. This improvement suggests stronger numerical sequencing skills following manipulative-based instruction. Donovan and Fyfe (2022) emphasized that connecting concrete materials with abstract numerical representations supports mathematical understanding. The reduced standard deviation indicates more consistent posttest performance, supporting the instructional relevance of activities involving numerical magnitude, place value, and flexible number ordering.

3.3.3 Mean Gain in Comparing Numbers up to 20

The pretest mean score of 16.86 (SD = 1.83) increased to 19.71 (SD = 0.61) during the posttest, producing a mean gain of 2.85 points. The paired-samples t-test established a statistically significant difference ($t = 7.322$, $p < .001$), resulting in rejection of the null hypothesis. This competency recorded the largest absolute mean gain among the three assessed competencies. The improvement suggests stronger understanding of numerical relationships after the intervention. Donovan and Fyfe (2022) emphasized the value of linking concrete representations with mathematical symbols, which is relevant to understanding numerical magnitude and comparison. However, the larger mean gain does not independently establish that this competency benefited significantly more than the others without a separate statistical comparison.

3.3.4 Overall Mean Gain in Grade 1 Mathematics Performance

Across all three competencies, the overall pretest mean score of 50.70 (SD = 3.44) increased to 59.00 (SD = 1.04) during the posttest, yielding a mean gain of 8.30 points. The difference was statistically significant ($t = 12.093$, $p < .001$), leading to rejection of the null hypothesis. Overall performance increased from approximately 85% MPS, interpreted as Moving Towards Mastery, to approximately 98% MPS, interpreted as Mastered. The findings demonstrate statistically significant improvements in learners' Mathematics performance during the instructional period. Angco and Angco (2024) identified improved mathematical proficiency, engagement, confidence, and motivation as recurring themes associated with manipulative-based instruction. The results support the potential usefulness of structured manipulatives in foundational Mathematics learning. Nevertheless, the one-group pretest–posttest design does not establish that the intervention alone caused the improvements, and the near-perfect posttest performance warrants consideration of possible ceiling effects.

3.4 Proposed Manipulative-Oriented Learning Exercises in Grade 1 Mathematics

The significant overall mean gain of 8.30 points ($t = 12.093$, $p < .001$) and the attainment of the Mastered level across the three competencies provided the basis for developing nine manipulative-oriented learning exercises. Three exercises addressed repeating patterns: Colorful Pattern Makers, Discover the Missing Number, and Build and Explain My Pattern. Three focused on number ordering: Number Line Adventure, The Biggest Comes First, and Leyte Market Number Challenge. The remaining exercises addressed number comparison: Which Basket Has More?, Crocodile Number Challenge, and Compare, Explain, and Solve. These activities incorporated bottle caps, shells, colored shapes, number cards, counters, number lines, and familiar community situations. The proposed exercises emphasize reinforcement and enrichment, particularly in number patterns, descending numerical ordering, and the application of numerical relationships. They encourage learners to progress from concrete manipulation to pictorial and symbolic representations while developing mathematical reasoning and independent problem-solving skills. The activities may be used for classroom instruction, remediation, and enrichment, subject to curriculum alignment. However, their effectiveness as supplementary materials requires further evaluation because the study assessed the instructional intervention rather than the proposed exercises themselves.

4. Conclusion & Recommendations

The study revealed significant improvements in the Mathematics performance of Grade 1 learners following the implementation of the manipulative teaching-learning strategy. Overall performance increased from a pretest mean score of 50.70 (85% MPS), interpreted as Moving Towards Mastery, to a posttest mean score of 59.00 (98% MPS), interpreted as Mastered. The overall mean gain of 8.30 points was statistically significant ($t = 12.093$, $p < .001$), with significant improvements in creating repeating patterns, ordering numbers up to 100, and comparing numbers up to 20. Although number patterns and descending numerical ordering initially demonstrated relatively lower performance, both attained mastery after the intervention. These findings indicate that manipulative-based instruction was associated with improved foundational mathematical competencies and provide a basis for developing contextualized learning exercises to reinforce and sustain learners' mathematical understanding.

Grade 1 Mathematics teachers are encouraged to integrate manipulative-oriented activities into regular instruction, particularly in repeating patterns, numerical ordering, and number comparison, while providing sustained reinforcement in number patterns and descending ordering. The proposed learning exercises should undergo review, validation, and pilot testing before being utilized as supplementary instructional materials. School heads, instructional supervisors, and the DepEd Schools Division of Leyte may support teacher professional development and the development of contextualized materials using accessible and locally available resources. Continuous formative assessment, enrichment activities, and follow-up evaluations are recommended to sustain mastery and assess learning retention. Future researchers may employ larger samples, comparison groups, extended intervention periods, and delayed posttests to strengthen evidence regarding the effectiveness and sustainability of manipulative-based Mathematics instruction.

The study was limited to 14 Grade 1 learners from one intact class at Atipolo Elementary School, Tanauan II District, Leyte, during School Year 2026–2027, and focused on three Mathematics competencies assessed through a one-group pretest–posttest design. The absence of a comparison group limited the ability to attribute the observed improvements exclusively to the manipulative teaching-learning strategy. The study assessed immediate learning gains without establishing long-term retention or the transfer of acquired skills to unfamiliar situations. Consequently, the findings should be interpreted within the specific classroom context, and their generalizability and causal implications remain limited.

5. Compliance with ethical standards

The author acknowledge the participating learners, their parents or guardians, and the school authorities for their cooperation. Conflict of interest and external funding declarations were not specified in the study. The study involving Grade 1 learners at Atipolo Elementary School, Tanauan II District, DepEd Schools Division of Leyte, was conducted with permission from the concerned school authorities, informed parental or guardian consent, and voluntary participation. Data were collected through non-invasive pretest and posttest assessments and developmentally appropriate instructional activities, with confidentiality maintained and no personally identifying information disclosed.

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