

The Effectiveness of the Manipulative-Based Learning in Improving the Conceptual Understanding in Mathematics 3 in Calauag East District, Division of Quezon

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ABSTRACT

The increasing complexity of elementary mathematics instruction requires approaches that help young learners translate abstract ideas into concrete experiences. Manipulative-based learning responds to this need by allowing pupils to touch, move, group, compare, and represent mathematical relationships through physical or digital tools. This study examined the effectiveness of manipulative-based learning in improving conceptual understanding in Mathematics 3 in Calauag East District, Division of Quezon. It focused on both the extent of utilization and the extent of effectiveness of the approach as perceived by Mathematics 3 teachers. The inquiry was anchored on the premise that conceptual understanding develops when learners are given opportunities to connect concrete experiences with mathematical language, representations, and procedures. Manipulatives such as counters, number lines, base-ten blocks, fraction tiles, and teacher-made materials can make numerical relationships more observable and meaningful. The study also considered that the value of manipulatives depends not merely on their availability but on the way teachers align them with lesson objectives. This orientation positioned manipulative-based learning as an instructional strategy rather than as a simple classroom material. The study employed a descriptive-evaluative-correlational research design. The locale was selected through purposive sampling, while the teacher-participants were included through total enumeration. Sixty-seven Mathematics 3 teachers served as respondents. Data were analyzed using weighted mean, rank, Kendall's Coefficient of Concordance W, and the corresponding chi-square test at the 0.05 level of significance. Findings showed that the utilization of manipulative-based learning was highly evident across the assessed instructional dimensions. Frequency of use, integration into lesson objectives, and learners' engagement during activities were interpreted as much evident. Variety of manipulatives used and collaboration and group activities were interpreted as very much evident. These results indicate that teachers use manipulatives not only as visual aids but also as tools for interaction, exploration, and peer-supported mathematical thinking. Among the utilization dimensions, the variety of manipulatives used received a very high rating, suggesting teacher resourcefulness and awareness of the need for multiple representations. Teachers reported using commercial, traditional, digital, and teacher-made manipulatives to support different topics and learning styles. Collaboration and group activities also received a very high rating, indicating that manipulatives were frequently used to promote peer discussion, teamwork, and shared problem solving. These findings suggest that manipulative-based learning is embedded in both individual and social dimensions of Mathematics 3 instruction. The effectiveness results showed that manipulative-based learning was much effective in improving conceptual understanding in Mathematics 3. The highest effectiveness ratings were found in problem-solving skills and visualization of abstract concepts. Engagement and motivation, as well as differentiated learning opportunities, were also rated as much effective. These outcomes show that manipulatives support both cognitive and affective aspects of mathematics learning. Kendall's W results showed no significant agreement on the rank orders of the utilization of manipulative-based learning across the assessed dimensions. The same pattern was observed for the effectiveness dimensions, where the null hypothesis was accepted across all areas. This indicates that although the overall ratings were favorable, teachers from different school categories did not demonstrate identical ranking patterns. Such variation may reflect differences in school resources, teacher training, class conditions, and instructional routines. The results carry important implications for mathematics instruction in the primary grades. Manipulatives are most productive when they are intentionally connected to objectives, concepts,

assessment tasks, and learner needs. Their use should not be limited to enrichment activities or introductory lessons but should be sustained throughout conceptual development, guided practice, problem solving, and remediation. Teacher support, resource adequacy, and systematic monitoring are therefore essential to maximize the instructional value of manipulative-based learning. The study concludes that manipulative-based learning provides a meaningful pathway for strengthening conceptual understanding in Mathematics 3. It enhances the visualization of abstract concepts, promotes step-by-step reasoning, supports differentiated instruction, and increases learner engagement. However, consistency in implementation remains an area for strengthening, particularly in relation to teacher training, material availability, and structured lesson integration. Institutional support is necessary to ensure that manipulative-based instruction becomes a regular, purposeful, and equitable practice. The findings affirm the continuing relevance of hands-on, learner-centered mathematics instruction in the early grades. For policy and practice, the study recommends regular professional development, sufficient provision of manipulatives, localized material development, and the inclusion of manipulative-based performance tasks in assessment systems. For research, future investigations may examine long-term retention, learner achievement data, comparative effects of physical and digital manipulatives, and inclusive applications for learners with diverse needs.

1. Introduction

Mathematics learning in the primary grades is a foundational element of schooling because it shapes how learners reason, compare, classify, represent, and solve problems. At this stage, pupils are still developing the mental structures needed to understand number, quantity, operations, measurement, patterns, and spatial relationships. When mathematical instruction is presented only through symbols and verbal explanations, many young learners may memorize procedures without understanding the ideas behind them. This makes the search for developmentally responsive strategies an urgent concern for classroom practice.

Conceptual understanding is a central goal of mathematics education because it allows learners to explain why a procedure works, not only how to perform it. Learners with conceptual understanding can connect representations, justify answers, and apply mathematical knowledge in unfamiliar situations. This type of understanding is especially important in Grade 3, where pupils encounter increasingly complex ideas such as multi-digit operations, fractions, measurement, and problem solving. Instruction must therefore provide bridges between concrete experience, pictorial representation, and symbolic abstraction.

Manipulative-based learning provides one of the most direct bridges between concrete experience and abstract mathematical reasoning. Manipulatives refer to physical or virtual objects that learners can use to model quantities, relationships, operations, and patterns. These materials include counters, base-ten blocks, number cards, fraction strips, geometric shapes, measurement tools, number lines, and digital simulations. Their instructional strength lies in giving learners visible and tactile access to mathematical relationships that are otherwise difficult to imagine.

The use of manipulatives is consistent with constructivist principles of learning. Piaget's theory emphasizes that children actively construct knowledge by interacting with objects and environments, while Bruner's representational theory recognizes the movement from enactive to iconic and symbolic modes of learning. Vygotsky's sociocultural perspective further suggests that tools, language, and social interaction mediate learning within guided instructional contexts. Manipulatives support these perspectives by making mathematical thinking observable, discussable, and gradually internalized.

Research literature has repeatedly associated manipulatives with improved mathematics learning when they are used with clear instructional guidance. Carbonneau, Marley, and Selig (2013) found that concrete manipulatives can support mathematics achievement, although effectiveness depends on instructional design and implementation conditions. Moyer-Packenham and Westenskow (2013) similarly reported that virtual manipulatives have affordances that can enhance mathematical learning when aligned with meaningful tasks. These findings suggest that manipulatives are most valuable when they are pedagogically integrated rather than casually introduced.

In the elementary classroom, manipulatives can help learners visualize place value, compare quantities, build arrays, compose and decompose numbers, and understand fractions as parts of a whole. They also allow learners to test mathematical ideas through trial, correction, and explanation. When learners manipulate objects, they can observe patterns and relationships that may not be immediately apparent in written symbols. This makes manipulatives particularly relevant for pupils who learn best through visual, kinesthetic, and tactile experiences.

Manipulative-based learning also strengthens problem-solving because it gives pupils tools for representing situations. Many mathematical word problems become more manageable when learners can model the problem using counters, drawings, blocks, number lines, or fraction pieces. The act of building a representation encourages learners to identify known quantities, relationships, operations, and possible solution paths. This process develops reasoning, persistence, and strategic thinking.

Another important value of manipulatives lies in learner engagement. Mathematics anxiety and low motivation often arise when learners perceive mathematics as abstract, difficult, or disconnected from experience. Hands-on activities can reduce these barriers by transforming mathematical learning into exploration and discovery. As learners see, touch, and move mathematical representations, they often become more willing to participate, ask questions, and explain their thinking.

Manipulatives also promote collaborative learning when they are used in pairs or groups. Group activities involving manipulatives encourage learners to discuss strategies, compare answers, justify procedures, and learn from peers. These interactions deepen

understanding because learners are required to verbalize their reasoning and respond to alternative approaches. In this sense, manipulative-based learning develops not only mathematical competence but also communication and cooperation.

The effectiveness of manipulatives, however, is not automatic. Research cautions that learners need explicit guidance to connect the object being manipulated with the mathematical concept being taught. If manipulatives are used without clear objectives, they may become distractions or mere play materials. The teacher's role remains essential in asking questions, directing attention, facilitating reflection, and helping learners move from concrete models to symbolic notation.

Teacher preparation is therefore a major factor in the successful implementation of manipulative-based learning. Teachers need knowledge of which manipulatives fit specific mathematical objectives, how to sequence activities, how to manage classroom interaction, and how to assess conceptual gains. They also need strategies for gradually reducing reliance on concrete materials as learners become more independent. Without adequate training, the use of manipulatives may remain inconsistent across classrooms. Availability of materials also influences the regularity and variety of manipulative-based instruction. Schools with more complete supplies can offer learners diverse materials for different mathematical domains, while schools with limited resources may depend on teacher-made or improvised materials. Digital manipulatives provide additional possibilities, especially where technology is available, but they also require teacher readiness and infrastructure. Equity in access is therefore a practical concern in sustaining manipulative-based learning.

Grade 3 is a critical level for examining manipulative-based learning because learners are transitioning from basic numeracy toward more structured mathematical reasoning. At this level, pupils need to understand not only counting and simple operations but also relationships among numbers, patterns, measurement, and problem-solving processes. If misconceptions are not addressed early, later mathematics learning becomes more difficult. Manipulatives can help prevent these misconceptions by grounding abstract symbols in concrete experiences.

The local implementation of manipulative-based learning requires empirical examination because classroom conditions differ by school size, resources, teacher confidence, and instructional support. Teachers may value manipulatives but differ in how often they use them and how systematically they align them with lesson objectives. Some classrooms may emphasize problem-solving and collaboration, while others may use manipulatives mainly during introductory activities. These variations make it necessary to assess both utilization and effectiveness.

This study focused on the effectiveness of manipulative-based learning in improving conceptual understanding in Mathematics 3 in Calauag East District, Division of Quezon. It examined utilization in terms of frequency of use, variety of manipulatives used, integration into lesson objectives, learners' engagement during activities, and collaboration and group activities. It also assessed effectiveness in terms of visualization of abstract concepts, problem-solving skills, engagement and motivation, and differentiated learning opportunities. The use of Kendall's Coefficient of Concordance further allowed the study to determine whether teachers shared similar ranking patterns across school categories.

By examining both instructional practice and perceived effectiveness, the study contributes to evidence-informed decision-making in elementary mathematics education. It provides a basis for improving teacher training, resource allocation, instructional supervision, and assessment practices. It also clarifies which areas of manipulative-based learning are already strong and which require further institutional support. Ultimately, the study advances the goal of making Mathematics 3 instruction more concrete, inclusive, engaging, and conceptually meaningful.

2. Methodology

The study used the descriptive-evaluative-correlational method of research. The descriptive component was used to determine the extent of utilization of manipulative-based learning and the extent of its effectiveness in improving conceptual understanding. The evaluative component was applied in interpreting the level of implementation and instructional effect across identified dimensions. The correlational element was reflected in the use of Kendall's Coefficient of Concordance to determine agreement in rank orders among respondent groups.

The study was conducted in Calauag East District, Division of Quezon during School Year 2024-2025. The locale was selected purposively because the setting provided an appropriate context for examining Mathematics 3 instruction and the use of hands-on learning strategies. The district included schools of different categories, allowing the study to compare rank order patterns across big, medium, and small schools. This selection supported a more contextualized understanding of how manipulative-based learning operates under varied school conditions.

The respondents of the study were Mathematics 3 teachers. Total enumeration was used to include the sixty-seven teachers who were directly involved in the teaching of Mathematics 3. This approach was appropriate because the population was manageable and because including all qualified teachers strengthened the representativeness of the findings within the district. The use of total enumeration also reduced sampling bias and allowed all relevant teacher perspectives to be considered.

The main research instrument was a structured questionnaire designed to gather data on the utilization and effectiveness of manipulative-based learning. The utilization component covered frequency of use, variety of manipulatives used, integration into lesson objectives, learner engagement during activities, and collaboration and group activities. The effectiveness component covered visualization of abstract concepts, problem-solving skills, engagement and motivation, and differentiated learning opportunities. The indicators were formulated to reflect instructional practices and learning outcomes associated with manipulative-based Mathematics 3 instruction.

The questionnaire used a weighted response scale that allowed teachers to rate the extent to which each indicator was evident or effective. For utilization, the interpretation scale included very much evident, much evident, evident, fairly evident, and not at all. For effectiveness, the corresponding scale included very much effective, much effective, effective, fairly effective, and not at all. These scales made it possible to quantify teachers' judgments while preserving categorical interpretation.

The data-gathering procedure involved the distribution and retrieval of the questionnaire among the identified teacher-respondents. Respondents were asked to evaluate their instructional practices and perceptions based on actual classroom experience in Mathematics 3. The responses were then organized, tallied, tabulated, and checked for completeness. The resulting dataset served as the basis for weighted mean computation, ranking, and concordance testing.

Weighted mean was used to determine the average extent of utilization and effectiveness for each indicator and dimension. Ranking was used to identify the relative strength of each indicator within its respective category. The interpretation of weighted means followed the established scale for utilization and effectiveness. These descriptive statistics provided an organized view of areas where manipulative-based learning was most and least evident or effective.

Kendall's Coefficient of Concordance W was used to determine whether there was significant agreement among the rank orders of the different school groups. The corresponding chi-square value was computed and compared with the tabular value at the 0.05 level of significance. The null hypothesis was accepted when the computed value did not exceed the critical value. This procedure enabled the study to determine whether perceptions across school categories followed a common pattern.

The analysis followed a dimension-by-dimension presentation to maintain clarity and coherence. Utilization results were first interpreted, followed by the test of significant agreement for utilization. Effectiveness results were then analyzed, followed by the test of significant agreement for effectiveness. The findings were subsequently used to develop conclusions and implications for policy, instruction, supervision, resource allocation, and future research.

3. Results and Discussions

This section presents the empirical results on the utilization and effectiveness of manipulative-based learning in improving conceptual understanding in Mathematics 3. The discussion begins with the extent of utilization across instructional dimensions, followed by detailed indicator-level results for each dimension. The analysis then presents the agreement test on rank orders before proceeding to the effectiveness dimensions. Each table is followed by analytical discussion linking the statistical findings to classroom practice, instructional design, and policy implications.

Table 1. Summary of the Extent of Utilization of Manipulative-Based Learning

Dimension	Weighted Mean	Interpretation	Rank
Frequency of Use	4.31	Much Evident	5
Variety of Manipulatives Used	4.57	Very Much Evident	1
Integration into Lesson Objectives	4.48	Much Evident	3
Learners' Engagement During Activities	4.40	Much Evident	4
Collaboration and Group Activities	4.54	Very Much Evident	2

Table 1 shows that the utilization of manipulative-based learning was generally high across all assessed dimensions. Collaboration and group activities registered a weighted mean of 4.54 and was interpreted as very much evident, while variety of manipulatives used obtained a weighted mean of 4.57 and was also interpreted as very much evident. Frequency of use, integration into lesson objectives, and learner engagement were interpreted as much evident. These results suggest that the strategy is present in Mathematics 3 instruction but is more strongly observed in social and material-related dimensions.

The strength of collaboration and variety indicates that teachers do not treat manipulatives as isolated demonstration objects. Instead, the materials appear to be used as shared learning tools that support peer explanation, discussion, and group problem solving. This is important because conceptual understanding is strengthened when learners compare representations and verbalize their reasoning. The result is consistent with sociocultural views of learning, where tools and interaction jointly mediate cognitive development.

The much evident ratings for frequency, integration, and engagement also reveal areas that require strengthening. Although teachers use manipulatives, implementation may still vary depending on lesson pacing, teacher confidence, and resource availability. A high rating does not necessarily mean uniform practice across all classrooms. It indicates that manipulative-based learning has been adopted but still needs deeper institutionalization to ensure regular and purposeful use.

Overall, the utilization profile supports the conclusion that manipulative-based learning is a recognized and active instructional practice in Mathematics 3. The findings point to a favorable foundation for improving conceptual understanding through concrete, visual, tactile, and collaborative experiences. However, sustained gains require alignment among curriculum planning, classroom routines, professional development, and assessment expectations. The results therefore justify more systematic support for manipulative-based mathematics instruction.

Table 2. Extent of Utilization in Terms of Frequency of Use

Indicator	Weighted Mean	Interpretation	Rank
Teachers integrate manipulatives into lessons at varying frequencies depending on lesson objectives and learner needs.	4.53	Very Much Evident	3
Some educators use manipulatives daily, while others incorporate them only during specific topics requiring hands-on exploration.	4.33	Much Evident	5
The availability of materials influences how often teachers utilize manipulative-based learning in their classrooms.	4.07	Much Evident	8.5
Time constraints and curriculum pacing affect how frequently manipulatives are incorporated into lessons.	4.29	Much Evident	6
Schools with strong instructional support tend to have teachers who consistently implement manipulatives.	4.01	Much Evident	10

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Indicator	Weighted Mean	Interpretation	Rank
Manipulatives are more frequently used in introductory lessons to help learners build foundational concepts.	4.07	Much Evident	8.5
Manipulative-based learning is more commonly applied in problem-solving activities and practical applications.	4.70	Very Much Evident	1
The frequency of manipulative use varies among teachers based on their confidence and training in hands-on teaching strategies.	4.57	Very Much Evident	2
Teachers who attend professional development programs on manipulative-based learning tend to use them more often.	4.10	Much Evident	7
Learners' engagement levels influence teachers' decisions on how often to use manipulatives.	4.47	Much Evident	4

The frequency-of-use results show that manipulative-based learning was most evident in problem-solving activities and practical applications. This highest-ranked indicator demonstrates that teachers commonly turn to manipulatives when learners need to model situations, test procedures, and make sense of real-life mathematical tasks. The finding suggests that manipulatives are viewed as problem-solving supports rather than mere decorative aids. Such use is pedagogically sound because concrete modeling can help learners identify relationships and operations embedded in mathematical situations.

The results also show that teacher confidence and training influence how often manipulatives are used. This pattern implies that professional capacity is a major determinant of instructional consistency. Teachers who are more comfortable managing hands-on activities are likely to integrate manipulatives more frequently and more purposefully. Thus, training should focus not only on the availability of materials but also on lesson design, questioning techniques, classroom management, and transitions from concrete to abstract representations.

The lower-ranked indicators point to constraints related to instructional support, material availability, and curriculum pacing. These constraints are common in elementary classrooms where teachers must balance coverage of competencies with meaningful exploration. If manipulatives are used only when time permits, learners may experience hands-on learning as occasional rather than systematic. To address this concern, lesson guides and daily plans should identify specific points where manipulatives can efficiently support conceptual development.

The much evident rating of 4.31 confirms that manipulative use is present but still variable. The result calls for a district-level effort to promote consistency without removing teacher flexibility. Mathematics coordinators can support this by creating sample routines for using manipulatives in warm-up activities, guided practice, remediation, and assessment. Consistent use can help learners build familiarity with mathematical representations and develop stronger conceptual connections over time.

Table 3. Extent of Utilization in Terms of Variety of Manipulatives Used

Indicator	Weighted Mean	Interpretation	Rank
Teachers utilize a range of manipulatives, such as base-ten blocks, number lines, fraction tiles, and counters.	4.74	Very Much Evident	3
Some classrooms primarily rely on traditional manipulatives, while others integrate digital tools.	4.40	Much Evident	8
The diversity of manipulatives used depends on school funding and resource availability.	4.12	Much Evident	10
Teachers with access to professional training use a wider variety of manipulatives in their lessons.	4.78	Very Much Evident	2
Some manipulatives are used more frequently due to their versatility in teaching multiple concepts.	4.57	Very Much Evident	6
Learners benefit from exposure to different manipulatives that cater to various learning styles.	4.70	Very Much Evident	4
Digital manipulatives are gaining popularity in schools with technological resources.	4.50	Very Much Evident	7
Teachers sometimes create their own manipulatives to supplement commercially available materials.	4.90	Very Much Evident	1
The variety of manipulatives used depends on the topic, with some requiring more hands-on tools than others.	4.64	Very Much Evident	5
Manipulatives that encourage interactive and collaborative learning are favored by teachers.	4.31	Much Evident	9

The variety-of-manipulatives results obtained the highest dimension rating, indicating that teachers use a broad range of hands-on and visual materials. Teacher-made manipulatives ranked first, showing strong resourcefulness and adaptation to classroom needs. This is significant because locally made materials can respond to limited budgets while still providing meaningful mathematical representations. The result also suggests that teachers are not entirely dependent on commercially produced resources.

The high ratings for professional training and the use of base-ten blocks, number lines, fraction tiles, and counters show that material variety is linked to teacher knowledge. Teachers who understand the instructional purpose of each manipulative are better able to select tools that match the mathematical concept. A diverse set of manipulatives enables learners to encounter the same concept through multiple representations. This is important because conceptual understanding deepens when learners can compare and translate among representations.

The emergence of digital manipulatives as a highly rated indicator reflects the growing relevance of technology-supported mathematics instruction. Digital tools can provide dynamic visualizations, immediate feedback, and opportunities for repeated practice. However, the lower rating for resource availability indicates that access may not be equal across schools. This suggests that digital manipulative use should complement, rather than replace, low-cost physical and teacher-made materials. The very much evident rating of 4.57 indicates a strong instructional foundation for differentiated and multimodal learning. Variety matters because pupils differ in readiness, learning style, attention span, and conceptual background. Teachers can use different manipulatives to support learners who need concrete counting, spatial visualization, pattern recognition, or symbolic transition. The result supports continued investment in diverse manipulative sets and localized material production.

Table 4. Extent of Utilization in Terms of Integration into Lesson Objectives

Indicator	Weighted Mean	Interpretation	Rank
Teachers align the use of manipulatives with specific lesson objectives to enhance conceptual understanding.	4.60	Very Much Evident	4
Manipulatives are most commonly integrated into lessons that require concrete visualization.	4.43	Much Evident	8
Lesson plans incorporating manipulatives provide structured guidance on their effective use.	4.37	Much Evident	9
Some teachers struggle to integrate manipulatives due to time constraints in lesson delivery.	4.00	Much Evident	12
Manipulatives are used to introduce, reinforce, and assess mathematical concepts.	4.60	Very Much Evident	4
Integration into lesson objectives ensures that manipulatives serve as learning tools rather than distractions.	4.55	Very Much Evident	7
Effective integration of manipulatives depends on teacher training and lesson preparation.	4.30	Much Evident	10
Hands-on activities using manipulatives are designed to meet specific learning outcomes.	4.70	Very Much Evident	2
The alignment of manipulatives with lesson objectives leads to better learner comprehension.	4.80	Very Much Evident	1
Teachers modify manipulative-based activities to fit various levels of learner proficiency.	4.60	Very Much Evident	4
Lesson integration of manipulatives varies between traditional and inquiry-based teaching methods.	4.59	Very Much Evident	6
Well-planned manipulative-based lessons enhance learner participation and conceptual mastery.	4.26	Much Evident	11

The integration results show that manipulatives were commonly connected with lesson objectives, although the overall interpretation remained much evident. The highest-ranked indicator states that alignment of manipulatives with objectives leads to better learner comprehension. This indicates that teachers recognize the importance of purposeful use. Manipulatives are most effective when they are selected because they represent a target concept, process, or competency.

Highly rated indicators also reveal that hands-on activities are designed to meet learning outcomes and that manipulatives are used to introduce, reinforce, and assess mathematical concepts. This suggests that teachers do not limit manipulatives to motivation or introduction. Instead, they use them at different points in the instructional cycle. Such integration supports the concrete-representational-abstract progression that is commonly recommended in mathematics pedagogy.

The lowest-ranked indicator concerns difficulty in integrating manipulatives because of time constraints. This result reveals a practical tension between hands-on learning and curriculum pacing. While manipulatives can improve understanding, they also require preparation, distribution, group management, and processing time. The solution is not to reduce manipulative use but to design shorter, well-structured routines that fit naturally within lesson delivery.

The much evident rating of 4.48 suggests that integration is strong but can still be improved. Teachers need clear exemplars showing how particular manipulatives support specific Mathematics 3 competencies. Lesson plans should include objectives, manipulative procedures, guiding questions, expected learner responses, and abstraction activities. With these supports, manipulatives can become embedded in instruction rather than added as optional activities.

Table 5. Extent of Utilization in Terms of Learners' Engagement During Activities

Indicator	Weighted Mean	Interpretation	Rank
Learners show higher engagement levels when manipulatives are incorporated into lessons.	4.50	Very Much Evident	5
Hands-on activities capture learners' interest and make lessons more interactive.	4.41	Much Evident	7
Manipulatives help sustain learners' attention, particularly in complex mathematical topics.	4.34	Much Evident	9
Engaged learners actively participate in discussions and problem-solving using manipulatives.	4.25	Much Evident	10

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Indicator	Weighted Mean	Interpretation	Rank
Physical interaction with manipulatives enhances learners' motivation to explore mathematical concepts.	4.66	Very Much Evident	1
Some learners prefer visual and kinesthetic learning, making manipulatives an essential tool.	4.51	Very Much Evident	4
Learners demonstrate a deeper understanding when actively engaged with manipulatives.	4.39	Much Evident	8
Teachers observe increased enthusiasm in classes that frequently use hands-on materials.	4.59	Very Much Evident	2
Manipulatives reduce learner anxiety by making abstract concepts more approachable.	4.44	Much Evident	6
Engagement levels are higher when manipulatives are used in collaborative learning settings.	4.18	Much Evident	12
The novelty of new manipulatives often sparks curiosity and excitement among learners.	4.58	Very Much Evident	3
Learners are more likely to retain information when actively involved in manipulative-based activities.	4.22	Much Evident	11
Interactive learning experiences foster a positive attitude toward Mathematics.	4.16	Much Evident	13

Learner engagement during manipulative-based activities was rated much evident, with physical interaction emerging as the strongest indicator. This means that touching, moving, arranging, and comparing materials motivates learners to explore mathematical ideas. The result reinforces the value of kinesthetic and tactile learning in the primary grades. Engagement is especially important in Mathematics 3 because learners often need sustained attention to understand operations, place value, measurement, and problem solving.

The findings also show that manipulatives increase enthusiasm, curiosity, and excitement. These affective responses matter because learners who feel interested are more likely to participate and persist in tasks. Manipulatives can reduce fear of mathematics by making abstract ideas approachable and visible. This supports the view that effective mathematics instruction must address both cognitive understanding and emotional readiness.

The lower-ranked indicators indicate that engagement alone does not automatically lead to retention, collaboration, or positive mathematical attitude. Learners may be excited by new materials but still require guided questioning and reflection to consolidate learning. Teachers therefore need to process manipulative activities by asking learners what they observed, why a method worked, and how the concrete model connects to symbols. Without this processing, engagement may remain superficial.

The rating of 4.40 confirms that manipulatives are meaningful engagement tools, but the result also calls for more structured activity design. Activities should move from exploration to explanation and then to independent application. Teachers can strengthen engagement by assigning roles, posing problem challenges, and requiring learners to record representations. This ensures that hands-on interest becomes conceptual learning.

Table 6. Extent of Utilization in Terms of Collaboration and Group Activities

Indicator	Weighted Mean	Interpretation	Rank
Group activities using manipulatives encourage peer discussion and teamwork.	4.60	Very Much Evident	4.5
Learners develop communication skills through collaborative problem-solving.	4.51	Very Much Evident	7
Manipulatives provide opportunities for cooperative learning in Mathematics.	4.46	Much Evident	9
Group-based manipulative activities help learners share and refine their ideas.	4.36	Much Evident	10
Collaborative learning with manipulatives enhances social interaction among peers.	4.76	Very Much Evident	1
Teachers design group tasks using manipulatives to promote cooperative learning.	4.56	Very Much Evident	6
Learners demonstrate critical thinking skills when working together on manipulative-based tasks.	4.63	Very Much Evident	3
Manipulatives encourage peer teaching and learning within groups.	4.60	Very Much Evident	4.5
Group activities using manipulatives help learners appreciate multiple problem-solving approaches.	4.70	Very Much Evident	2
Cooperative learning improves learners' confidence in Mathematics.	4.47	Much Evident	8
Collaboration through manipulatives strengthens learners' problem-solving abilities and conceptual understanding.	4.25	Much Evident	11

Collaboration and group activities received a very much evident rating, showing that manipulatives are strongly associated with cooperative mathematics learning. The highest-ranked indicator indicates that collaborative learning with manipulatives enhances social interaction among peers. This result is important because mathematical understanding is often strengthened through dialogue and shared problem-solving. Learners benefit when they explain, question, and revise ideas with classmates.

The results show that group activities help learners appreciate multiple problem-solving approaches. This is a key element of conceptual understanding because learners see that mathematical tasks can be represented and solved in different ways. Manipulatives make these alternative strategies visible. As learners compare models, they become more aware of mathematical structure rather than focusing only on final answers.

Highly rated indicators on peer discussion, teamwork, peer teaching, and communication skills show that manipulative-based learning supports social and language development alongside mathematics learning. Mathematics classrooms become more interactive when pupils work together around shared materials. The teacher's responsibility is to maintain productive collaboration by setting expectations, assigning roles, and ensuring equal participation. This prevents group work from becoming dominated by only a few learners.

The very much evident rating of 4.54 suggests that manipulatives are already functioning as tools for cooperative learning. This strength can be further developed through structured group tasks, performance-based activities, and peer explanation routines. Collaborative manipulative use is especially valuable for learners who may struggle alone but succeed with guided peer support. It also prepares pupils to view mathematics as a process of reasoning, communication, and shared inquiry.

Table 7. Test of Significant Agreement on the Rank Orders of Utilization

Dimension	Kendall's W	Computed chi-square	df	Critical value at 0.05	Decision	Interpretation
Frequency of Use	0.44	11.88	9	16.92	Accepted	Not Significant
Variety of Manipulatives Used	0.55	14.58	9	16.92	Accepted	Not Significant
Integration into Lesson Objectives	0.46	15.18	11	19.68	Accepted	Not Significant
Learners' Engagement During Activities	0.22	7.92	12	21.03	Accepted	Not Significant
Collaboration and Group Activities	0.30	9	10	18.31	Accepted	Not Significant

Table 7 shows that the null hypothesis was accepted for all utilization dimensions. The computed chi-square values did not exceed the corresponding tabular values at the 0.05 level of significance. This means that there was no significant agreement on the rank orders of utilization across the different school groups. The result suggests that teachers from various school categories differed in how they prioritized specific indicators of manipulative-based learning.

The absence of significant agreement should not be interpreted as a weak implementation result. Rather, it indicates variation in ranking patterns across school contexts. Big, medium, and small schools may have different resource levels, class sizes, instructional supports, and teacher experiences. These contextual differences can shape which aspects of manipulative-based learning are emphasized most strongly.

The highest W value appeared in the variety of manipulatives used, while the lowest appeared in learner engagement during activities. This pattern suggests that agreement was relatively stronger regarding material variety than regarding engagement-related practices. Engagement can vary greatly depending on teacher facilitation, learner characteristics, and classroom dynamics. Therefore, engagement-focused strategies may require more shared professional learning across schools.

The results imply the need for common implementation standards while preserving local adaptability. District-wide guidelines can identify essential manipulative-based practices, while teachers can adapt materials and activities to their learners' needs. Monitoring should focus not only on whether manipulatives are present but also on how they are selected, integrated, and processed. This can reduce unevenness in practice and strengthen consistency across school categories.

Table 8. Summary of the Extent of Effectiveness of Manipulative-Based Learning

Dimension	Weighted Mean	Interpretation	Rank
Visualization of Abstract Concepts	4.37	Much Effective	2
Problem-Solving Skills	4.42	Much Effective	1
Engagement and Motivation	4.35	Much Effective	3
Differentiated Learning Opportunities	4.30	Much Effective	4

Table 8 shows that manipulative-based learning was much effective across all effectiveness dimensions. Problem-solving skills obtained the highest mean, followed by visualization of abstract concepts, engagement and motivation, and differentiated learning opportunities. This distribution indicates that manipulative-based learning is particularly valuable in helping learners reason through mathematical tasks. It also confirms that manipulatives support both cognitive processing and learner participation.

The high rating for problem-solving skills is pedagogically significant. Problem solving requires learners to understand the problem situation, select appropriate representations, test strategies, and evaluate answers. Manipulatives support this process by allowing learners to model conditions and examine relationships concretely. This explains why hands-on materials are especially useful when learners encounter mathematical problems that require reasoning rather than memorization.

Visualization of abstract concepts also emerged as a strong dimension. This result is expected because manipulatives are designed to convert abstract ideas into visible and tangible forms. Place value, fractions, operations, patterns, and measurement concepts become easier to understand when learners can see and manipulate representations. The result reinforces the importance of moving from concrete experiences toward symbolic understanding.

The much effective ratings for engagement, motivation, and differentiated learning opportunities show that manipulatives address diverse learner needs. They help make mathematics less intimidating while allowing teachers to adapt instruction for learners with different readiness levels. However, these areas did not reach a uniformly very much effective level, indicating room for stronger facilitation and follow-up. Teachers need support in transforming hands-on activities into durable conceptual learning.

Table 9. Extent of Effectiveness in Terms of Visualization of Abstract Concepts

Indicator	Weighted Mean	Interpretation	Rank
Manipulatives help learners convert abstract mathematical ideas into tangible representations.	4.30	Much Effective	8.5

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Indicator	Weighted Mean	Interpretation	Rank
Visualization through manipulatives improves learners' comprehension of complex concepts.	4.13	Much Effective	10.5
Learners grasp number relationships better when using physical models.	4.60	Very Much Effective	1
Hands-on materials reduce misconceptions in learning mathematical operations.	4.37	Much Effective	7
Manipulatives provide a bridge between abstract theory and practical understanding.	4.44	Much Effective	3
Teachers use manipulatives to demonstrate step-by-step problem-solving processes.	4.30	Much Effective	8.5
Learners retain information better when they physically interact with concepts.	4.52	Very Much Effective	2
Abstract concepts like fractions and decimals become clearer with visual aids.	4.39	Much Effective	5.5
Manipulatives facilitate spatial reasoning and numerical fluency.	4.39	Much Effective	5.5
The use of concrete objects enhances learners' confidence in mathematical reasoning.	4.41	Much Effective	4
Learners benefit from multiple representations of the same concept using manipulatives.	4.13	Much Effective	10.5

The visualization results show that manipulatives help learners grasp number relationships and retain information through physical interaction. These indicators ranked highest because concrete models allow learners to observe mathematical relationships that may be invisible in symbolic form. When pupils use blocks, counters, number lines, or fraction pieces, they can see how quantities change and how parts relate to wholes. This strengthens the bridge between direct experience and abstract mathematical reasoning.

The findings also indicate that manipulatives provide a bridge between abstract theory and practical understanding. This confirms the instructional role of concrete models in reducing misconceptions. Learners who can physically represent a concept are better positioned to understand why a mathematical procedure works. This is especially important for early-grade learners who are still developing abstract reasoning skills.

The lower-ranked indicators still received much effective interpretations, showing that all visualization-related outcomes were favorable. However, the comparatively lower ratings for complex concepts and multiple representations suggest that teachers may need additional training in using manipulatives beyond simple demonstrations. Multiple representations require purposeful sequencing from object to picture to symbol. This requires teachers to facilitate connections explicitly.

The overall rating of 4.37 indicates that visualization is a strong contribution of manipulative-based learning. The implication is that Mathematics 3 lessons should regularly include manipulatives when introducing or clarifying abstract concepts. Teachers should also ask learners to draw, explain, and write equations based on the manipulative model. This helps learners internalize the concept beyond the physical activity.

Table 10. Extent of Effectiveness in Terms of Problem-Solving Skills

Indicator	Weighted Mean	Interpretation	Rank
Manipulatives help learners explore different problem-solving strategies.	4.50	Very Much Effective	6.5
Hands-on learning encourages logical reasoning and analytical thinking.	4.71	Very Much Effective	2
Learners develop persistence when solving mathematical problems with manipulatives.	4.50	Very Much Effective	6.5
Manipulatives support step-by-step problem-solving processes.	4.80	Very Much Effective	1
Real-world applications of manipulatives improve problem-solving skills	4.64	Very Much Effective	3
Learners gain confidence in tackling mathematical challenges using hands-on tools.	4.14	Much Effective	12
The use of manipulatives fosters critical thinking in Mathematics.	4.25	Much Effective	9.5
Group problem-solving activities using manipulatives enhance reasoning skills.	4.25	Much Effective	9.5
Learners discover multiple solution paths through manipulative-based exploration.	4.15	Much Effective	11
The hands-on approach reduces learner frustration in solving complex problems.	4.51	Very Much Effective	5
Manipulatives allow learners to test and refine their problem-solving methods.	4.47	Much Effective	8
Teachers observe improved learner accuracy when using manipulatives.	4.03	Much Effective	13
Problem-solving with manipulatives enhances mathematical reasoning and fluency.	4.53	Very Much Effective	4

Problem-solving skills received the highest effectiveness rating among the assessed dimensions. The top indicator shows that manipulatives support step-by-step problem-solving processes. This is important because many learners struggle not with calculation alone but with understanding how to approach a problem. Manipulatives provide a concrete pathway for planning, representing, solving, and checking solutions.

The high ratings for logical reasoning, analytical thinking, real-world application, and mathematical fluency indicate that manipulative-based learning develops more than procedural skill. Learners are able to explore different strategies and examine why certain methods work. Manipulatives encourage experimentation, allowing pupils to test and refine solutions without immediately relying on abstract symbols. This can reduce frustration and build confidence.

The lower-ranked indicators on accuracy, confidence, and multiple solution paths still received much effective ratings. This suggests that manipulatives contribute to problem solving but require sustained teacher guidance to maximize accuracy and independence. Learners may need repeated opportunities to explain their manipulative models and compare them with symbolic solutions. Without explicit processing, problem-solving gains may remain activity-based rather than transferable. The overall rating of 4.42 supports the conclusion that manipulative-based learning is effective for problem-solving development. To further strengthen this dimension, teachers should integrate manipulatives into contextual problems, performance tasks, and group investigations. Lessons should require learners to represent, reason, communicate, and justify solutions. This approach can cultivate deeper mathematical thinking in Grade 3.

Table 11. Extent of Effectiveness in Terms of Engagement and Motivation

Indicator	Weighted Mean	Interpretation	Rank
Learners show increased enthusiasm when using manipulatives in Mathematics lessons.	4.16	Much Effective	10
Hands-on activities make learning more interactive and enjoyable, sustaining learners' interest.	4.64	Very Much Effective	1
Manipulatives provide a fun and engaging way to explore mathematical concepts.	4.50	Very Much Effective	3
Learners are more motivated to participate when they can physically manipulate objects.	4.20	Much Effective	8
The use of manipulatives encourages active learning, making learners more involved in lessons.	4.18	Much Effective	9
Learners exhibit greater perseverance in problem-solving tasks when manipulatives are used.	4.45	Much Effective	4
The novelty of using different manipulatives sparks curiosity and excitement in the classroom.	4.22	Much Effective	7
Teachers observe improved attention spans during manipulative-based learning sessions.	4.27	Much Effective	5.5
Manipulative-based learning reduces learners' fear of Mathematics by making it more approachable.	4.60	Very Much Effective	2
Hands-on experiences provide immediate feedback, keeping learners engaged in the learning process.	4.27	Much Effective	5.5

The engagement and motivation results show that hands-on activities make mathematics more interactive and enjoyable. Learners are more likely to sustain interest when they can physically manipulate objects or use materials to explore concepts. The top indicators reveal that manipulatives reduce fear and make mathematical learning more approachable. This affective benefit is important because motivation influences participation, persistence, and willingness to attempt challenging tasks.

The findings also indicate that manipulatives create a fun and engaging way to explore concepts. Enjoyment does not reduce academic seriousness; rather, it can open opportunities for deeper involvement. When learners are curious and attentive, teachers can guide them toward conceptual discovery. The use of manipulatives can therefore make learning both enjoyable and intellectually productive.

Some indicators related to attention span, immediate feedback, and active involvement received slightly lower but still positive ratings. These results suggest that motivation must be sustained through thoughtful task design. Novel materials may initially spark interest, but long-term engagement depends on meaningful challenges, reflection, and feedback. Teachers should avoid using manipulatives only for excitement and instead connect them directly to mathematical goals.

The overall rating of 4.35 indicates that manipulative-based learning is much effective in supporting engagement and motivation. The implication is that hands-on mathematics activities should be carefully planned to include clear objectives, learner accountability, and processing questions. Engaged learners should be asked to explain, record, and apply what they learned. This ensures that motivation becomes a pathway to conceptual understanding.

Table 12. Extent of Effectiveness in Terms of Differentiated Learning Opportunities

Indicator	Weighted Mean	Interpretation	Rank
Manipulatives allow teachers to adapt lessons to different learning styles and abilities.	4.50	Very Much Effective	3
Learners progress at their own pace when using manipulatives to explore concepts.	4.15	Much Effective	11
Hands-on activities cater to visual, kinesthetic, and tactile learners, ensuring inclusivity.	4.14	Much Effective	12
Manipulatives provide struggling learners with concrete experiences to support abstract thinking.	4.38	Much Effective	4.5
Advanced learners benefit from manipulatives by deepening their conceptual understanding through self-discovery.	4.32	Much Effective	7

Indicator	Weighted Mean	Interpretation	Rank
Teachers use manipulatives to create leveled activities that meet the needs of diverse learners.	4.38	Much Effective	4.5
Learners with special needs find manipulatives helpful in grasping mathematical concepts.	4.01	Much Effective	13
Small-group instruction using manipulatives enhances individualized learning.	4.22	Much Effective	8
Differentiated instruction through manipulatives allows for personalized feedback and assessment.	4.16	Much Effective	10
Manipulatives help bridge gaps between learners with varying levels of mathematical proficiency.	4.64	Very Much Effective	1
Teachers use manipulatives to modify instruction for learners requiring additional support.	4.33	Much Effective	6
Engaging with manipulatives fosters confidence in learners at different skill levels.	4.51	Very Much Effective	2
The adaptability of manipulatives ensures all learners have access to meaningful and effective Mathematics instruction.	4.20	Much Effective	9

Differentiated learning opportunities were rated much effective, showing that manipulatives help teachers respond to varied learner needs. The highest-ranked indicator indicates that manipulatives bridge gaps among learners with different levels of mathematical proficiency. This is important in Mathematics 3 classrooms where pupils may differ in number sense, language ability, attention span, and confidence. Concrete materials provide access points for struggling learners while still supporting enrichment for advanced learners.

The results show that manipulatives foster confidence, allow teachers to adapt lessons, and support different learning styles and abilities. This aligns with inclusive instructional practice because visual, tactile, and kinesthetic learners can participate more meaningfully. Manipulatives also allow teachers to create leveled activities, provide additional support, and offer individualized explanations. Such flexibility makes mathematics instruction more responsive and equitable.

Lower-ranked indicators related to learners with special needs, self-paced exploration, and tactile learning still received much effective ratings. These results suggest that while differentiation is present, it can be further strengthened through more intentional planning. Teachers may need prepared task cards, leveled manipulative kits, and explicit accommodations for learners with different needs. Differentiation must be planned rather than left to informal adjustment during instruction.

The overall rating of 4.30 confirms that manipulative-based learning supports differentiated mathematics instruction. Its value lies in giving teachers multiple ways to present, practice, and assess concepts. To maximize this benefit, schools should provide varied materials and train teachers in using manipulatives for remediation, enrichment, and inclusive education. This can help ensure that all learners experience meaningful access to Mathematics 3 concepts.

Table 13. Test of Significant Agreement on the Rank Orders of Effectiveness

Dimension	Kendall's W	Computed chi-square	df	Critical value at 0.05	Decision	Interpretation
Visualization of Abstract Concepts	0.26	7.8	10	18.31	Accepted	Not Significant
Problem-Solving Skills	0.48	17.28	12	21.03	Accepted	Not Significant
Engagement and Motivation	0.29	7.63	9	16.92	Accepted	Not Significant
Differentiated Learning Opportunities	0.45	16.20	12	21.03	Accepted	Not Significant

Table 13 shows that the null hypothesis was accepted for all effectiveness dimensions. The computed chi-square values were lower than their respective tabular values at the 0.05 level of significance. This means that there was no significant agreement on the rank orders of effectiveness across school groups. The result indicates that although teachers generally viewed manipulative-based learning as effective, they did not rank its effectiveness dimensions in the same way.

The lack of significant agreement may be explained by differences in classroom conditions and instructional emphases. Some teachers may observe stronger effects on visualization because of the topics they teach, while others may observe stronger effects on problem solving or motivation. Availability of manipulatives, teacher experience, and learner readiness can also shape perceptions of effectiveness. These contextual differences are important for interpreting the results.

The W values suggest low to moderate agreement across dimensions. Problem-solving skills showed the highest W value among effectiveness dimensions, while visualization of abstract concepts showed the lowest. This may indicate that teachers have somewhat more similar perceptions regarding the role of manipulatives in problem solving than in visualization. Nevertheless, all decisions point to non-significant agreement, emphasizing the need for shared instructional benchmarks.

The implication is that effectiveness can be strengthened through more common understandings of what successful manipulative-based learning looks like. Teachers should be guided in observing learner outcomes such as representation accuracy, conceptual explanations, transfer to symbols, and independent problem solving. Professional learning communities can use common rubrics and sample lessons to calibrate expectations. This would support more consistent implementation and evaluation across school categories.

4. Conclusions and Implications

4.1 Conclusions

The findings show that manipulative-based learning is a strongly present instructional practice in Mathematics 3. Teachers use manipulatives across several dimensions, including frequency of use, material variety, lesson integration, learner engagement, and collaboration. The overall pattern indicates that hands-on learning is not incidental but forms part of regular mathematics instruction. This confirms the relevance of manipulative-based learning in supporting conceptual understanding among primary-grade learners. The strongest utilization results were observed in the variety of manipulatives used and collaboration and group activities. This indicates that teachers are resourceful in using different materials and that they frequently employ manipulatives to support peer learning. Teacher-made, traditional, and digital materials provide multiple pathways for representing mathematical ideas. The collaborative use of manipulatives further strengthens communication, teamwork, and shared reasoning.

Frequency of use, integration into lesson objectives, and learner engagement were interpreted as much evident. These results show that manipulative-based learning is actively used but still needs stronger consistency and deeper integration. Some variation may be due to lesson pacing, availability of materials, teacher confidence, and classroom management concerns. Therefore, manipulative use should be supported by structured lesson planning and sustained professional development.

The test of significant agreement on utilization showed no significant agreement among rank orders across school groups. This means that teachers from different school categories did not rank the utilization indicators in identical ways. The result points to contextual differences in school resources, teacher experience, and classroom priorities. Such variation should be addressed through common guidelines, coaching, and monitoring while still allowing appropriate local adaptation.

Manipulative-based learning was found to be much effective in improving conceptual understanding in Mathematics 3. Its strongest contribution was observed in problem-solving skills, followed by visualization of abstract concepts, engagement and motivation, and differentiated learning opportunities. These findings support the view that manipulatives help pupils reason, represent, and explore mathematical ideas. They also show that manipulatives support both cognitive and motivational aspects of learning.

The effectiveness findings confirm that manipulatives help transform abstract mathematical content into concrete and meaningful experiences. Learners benefit when they can physically model relationships, test strategies, and compare representations. This is especially important in Grade 3, where pupils are developing more advanced understanding of operations, quantities, and problem situations. Manipulatives therefore serve as bridges between concrete experience and symbolic mathematics.

The test of significant agreement on effectiveness also showed no significant agreement among rank orders across school groups. This suggests that teachers may observe different effectiveness patterns depending on their instructional contexts. Although the overall evaluation was favorable, the lack of agreement indicates that the same strategy may produce different perceived strengths across schools. Shared standards for observing and assessing manipulative-based outcomes are needed to reduce these differences.

Taken together, the study concludes that manipulative-based learning is a useful and effective strategy for strengthening conceptual understanding in Mathematics 3. Its value is most evident when materials are varied, aligned with objectives, used collaboratively, and connected to problem-solving tasks. However, the strategy requires deliberate planning, teacher preparation, material support, and systematic assessment. Institutionalizing these supports can transform manipulative-based learning from a useful classroom practice into a sustained instructional policy.

4.2 Implications

The findings imply that school heads should institutionalize regular monitoring of manipulative-based instruction in Mathematics 3. Classroom observations should examine not only whether manipulatives are used but how they are connected to objectives, questions, learner responses, and assessment. Observation tools may include indicators on concrete modeling, learner explanation, symbolic transition, and collaborative problem solving. This would help ensure that manipulative use remains purposeful and instructionally productive.

The results imply that Mathematics coordinators should prepare localized instructional guides for manipulative-based learning. These guides should identify appropriate manipulatives for specific Mathematics 3 competencies and provide sample activities for introduction, guided practice, independent work, remediation, and assessment. Localized guides would help teachers use available materials efficiently. They would also promote consistency across schools while allowing teachers to adapt activities to learner needs.

Professional development is strongly implied by the findings. Since teacher confidence and training influence frequency and quality of use, workshops should focus on designing, facilitating, and assessing manipulative-based activities. Training should include concrete-representational-abstract sequencing, group management, differentiated instruction, and strategies for connecting manipulatives to symbolic notation. Sustained coaching is preferable to one-time orientation because effective implementation requires practice and feedback.

The findings also imply that resource provision must be strengthened. Schools need sufficient supplies of base-ten blocks, counters, number lines, fraction tiles, geometric materials, measurement tools, and improvised manipulative kits. Digital manipulatives may also be introduced where infrastructure allows. Resource provision should be equitable so that learners across big, medium, and small schools can experience meaningful hands-on mathematics instruction.

Curriculum planners should consider integrating manipulative-based learning into official lesson exemplars and assessment frameworks. Manipulatives should not be treated only as optional enrichment materials. They can be used to demonstrate conceptual understanding through performance tasks, learner explanations, models, and written reflections. Assessment systems that value authentic mathematical reasoning can encourage teachers to use manipulatives more consistently.

The results imply that teachers should use manipulatives to support differentiated instruction. Learners who struggle with abstract concepts may need concrete materials, repeated modeling, and guided representations. Advanced learners may use manipulatives to explore alternative strategies, create patterns, and justify generalizations. This flexibility makes manipulative-based learning a practical approach for inclusive Mathematics 3 classrooms.

The findings further imply that collaboration with parents, local government units, and school governing councils can expand access to manipulative materials. Low-cost and indigenous materials may be developed from recyclable objects, local resources, and home-based kits. Such collaboration can extend conceptual learning beyond the classroom. It can also reduce dependence on expensive commercial materials while promoting community support for mathematics education.

Future research should move beyond teacher perceptions by including learner performance data, classroom observations, and longitudinal measures. Studies may examine whether regular manipulative-based instruction improves retention, transfer, achievement, and attitudes toward mathematics over time. Comparative research may also investigate physical versus digital manipulatives and their combined use. These future inquiries can provide stronger evidence for scaling manipulative-based learning across elementary mathematics programs.

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