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The Activities in Improving the Academic Performance of the Grade 2 Learners in Mathematics in Libmanan South District, Division of Camarines Sur

Maricar F. Brezuela[1]

[1]University of Northeastern Philippines, School of Graduate Studies

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ABSTRACT

This study examined Grade 2 mathematics performance and the instructional activities employed by teachers in Libmanan South District, Division of Camarines Sur, during School Year 2023–2024. A descriptive-evaluative, inferential, and correlational survey used total enumeration of 47 Grade 2 teachers across five school clusters. Reported learner-performance categories for the third and fourth quarters were summarized for addition, subtraction, multiplication, and division; teacher ratings were analyzed through weighted means, Kruskal–Wallis procedures, and Kendall's coefficient of concordance. Performance shifted most favorably in addition, where the modal category moved from Emerging (77%) to Developing (77%). Subtraction also shifted toward Developing (51%), whereas multiplication and division remained concentrated in Emerging or Anchoring categories. The source reported no significant quarter difference for any operation, although exact probability values were not supplied. Instructional quality received the highest activity rating (M=4.44), followed by a favorable learning environment (M=4.25), student engagement and motivation (M=4.20), mathematics resource kits (M=3.69), and parental involvement (M=2.97). Concordance was significant for engagement, parental involvement, resource kits, and learning environment, but not for instructional quality. The results support an operation-specific numeracy response combining explicit instruction, mathematical representations, brief formative checks, targeted practice, family-accessible routines, and resource monitoring. Because the design was descriptive and the achievement summaries were aggregated, the findings do not establish that the rated activities caused the observed quarter-to-quarter changes.

1. Introduction

Early mathematics proficiency develops through connected experiences with number, quantity, operations, patterns, representations, reasoning, and mathematical language. In Grade 2, addition and subtraction consolidate place-value understanding, while multiplication and division introduce equal groups, arrays, sharing, and inverse relationships. Weak conceptual foundations at this stage can become cumulative barriers to later problem solving.

National and international evidence gives urgency to foundational numeracy. The OECD's PISA 2022 country note reported that Philippine performance remained low relative to international benchmarks, while the Basic Education Development Plan 2030 identifies learning quality, equity, and recovery as system priorities (Department of Education, 2022; OECD, 2023). Although PISA assesses older learners, the policy implication is developmental: gaps should be identified and addressed before they harden into persistent difficulty.

Effective early mathematics instruction is more than repeated computation. Learners benefit from explicit modeling, purposeful questioning, manipulatives, drawings, number lines, worked examples, retrieval practice, feedback, and opportunities to explain strategies. Representations are most productive when teachers help learners connect concrete actions to visual and symbolic forms rather than treating materials as ends in themselves (National Mathematics Advisory Panel, 2008).

Engagement and classroom climate influence whether learners persist with challenging tasks. Productive engagement is not simply enjoyment; it includes sustained attention, mathematical talk, willingness to make errors visible, and repeated opportunities to revise thinking. A safe and organized environment supports these behaviors, while formative assessment enables teachers to adjust pacing and task difficulty.

Home participation can extend practice and communicate that mathematics is useful, but access and confidence vary across families. Activities should therefore be brief, understandable, low-cost, and flexible. Parent involvement is best framed as supportive interaction—counting, comparing, estimating, explaining, and playing number games—rather than transferring the teacher's instructional burden to the household.

The present district evidence provides two complementary views: categorical summaries of learner performance across quarters and teachers' ratings of the activities used to improve performance. Examining both can locate priority operations and implementation conditions, but it does not demonstrate a direct causal pathway between a particular activity and a score change.

A journal-oriented analysis must also distinguish statistical evidence from the labels used in a thesis table. Test statistics are not probability values. Accordingly, the reported Kruskal–Wallis quantities are presented as H statistics and their source decisions are retained, while exact p-values are identified as unavailable rather than reconstructed.

1.1 Research Purpose and Analytical Focus

The study aimed to describe Grade 2 learner performance in addition, subtraction, multiplication, and division during the third and fourth quarters; determine whether the reported quarterly distributions differed; assess the extent to which five categories of improvement activity were employed; and examine concordance in the ranking of those activities across school clusters.

The analytical emphasis was practical and diagnostic: to identify operation-specific learning needs, distinguish strong from underdeveloped implementation components, and formulate a district improvement framework that links instruction, engagement, resources, environment, family partnership, and credible progress monitoring.

1.2 Conceptual and Empirical Synthesis

The analysis is organized as an instructional improvement cycle. Assessment identifies the concept or operation requiring attention; teachers select representations and tasks aligned with that need; learners receive guided and independent practice; brief checks reveal misconceptions; and subsequent instruction is adapted. The value of any activity depends on its alignment with this cycle.

The five activity domains are mutually enabling. Quality instruction supplies mathematical coherence; engagement sustains participation; resource kits provide representations and practice tools; the learning environment protects time and interaction; and family participation extends low-stakes rehearsal. A weakness in one domain can reduce the reach of the others.

Quarterly category shifts are interpreted as descriptive signals. A stronger category in a later quarter may reflect instruction, task differences, maturation, attendance, assessment difficulty, or cohort composition. Without matched learner records, common calibrated tests, and a comparison condition, causal attribution is inappropriate.

2. Methodology

A descriptive-evaluative, inferential, and correlational design was used in Libmanan South District, Division of Camarines Sur, during School Year 2023–2024. The locale was organized into five school clusters.

Total enumeration included 47 Grade 2 teachers. A researcher-made 62-item questionnaire, as indicated by the reported table of specifications, measured the extent of activities employed through a five-point scale. Learner performance was summarized in four proficiency categories—Emerging, Developing, Anchoring, and Transforming—for the four fundamental operations.

Frequencies and percentages described performance categories; weighted means and ranks summarized activity ratings. Kruskal–Wallis procedures were reported for quarter comparisons, and Kendall's W with corresponding chi-square statistics examined agreement in activity rankings across clusters.

The article preserves the numeric results reported in the study but applies conservative terminology. Reported test quantities are not converted to p-values, and causal language is avoided because the design did not randomly assign learners or directly link individual activity exposure with individual achievement.

Table 1. Research Design, Participants, Measures, and Analysis

Component	Specification
Design and locale	Descriptive-evaluative, inferential, and correlational study; Libmanan South District; SY 2023–2024
Participants	Total enumeration of 47 Grade 2 teachers across five school clusters
Measures	Reported quarterly proficiency categories and a researcher-made 62-item, five-point activity questionnaire
Activity domains	Quality of instruction; engagement and motivation; parental involvement; mathematics resource kits; favorable learning environment
Analysis	Frequency, percentage, weighted mean, rank, Kruskal–Wallis H, Kendall's W, and chi-square

2.1 Analytical Rigor and Boundaries

The use of total enumeration reduces sampling error for the identified teacher population and allows cluster-level comparisons. Operation-specific reporting also prevents a single overall mathematics score from concealing distinct patterns in addition, subtraction, multiplication, and division.

Three reporting constraints require caution. Exact p-values for the Kruskal–Wallis tests were not supplied; the fourth-quarter multiplication counts shown in the source do not sum to the stated teacher total; and the proficiency summaries are aggregated rather than matched learner records. The article therefore reports the available statistics without repairing missing cells or asserting significance beyond the source decision.

A stronger replication should use a common assessment blueprint, matched learner identifiers, item-level reliability and difficulty evidence, documented activity dosage, fidelity observations, cluster sizes, complete missing-data rules, effect sizes, and confidence intervals.

3. Results and Discussion

3.1 Quarterly Performance in Addition and Subtraction

The most favorable modal shift occurred in addition; subtraction improved more modestly.

Table 2. Reported Quarterly Performance Categories for Addition and Subtraction

Operation	Quarter	Emerging	Developing	Anchoring	Transforming
Addition	Third	36 (77%)	9 (19%)	2 (4%)	0
Addition	Fourth	9 (19%)	36 (77%)	0	2 (4%)
Subtraction	Third	35 (74%)	5 (11%)	7 (15%)	0
Subtraction	Fourth	22 (47%)	24 (51%)	1 (2%)	0

Addition changed from a predominantly Emerging profile in the third quarter to a predominantly Developing profile in the fourth quarter. The simultaneous appearance of a small Transforming group suggests that some classes reached advanced performance, but 19% remained Emerging. The practical implication is differentiated consolidation: learners who can execute procedures need reasoning and transfer tasks, while those still Emerging require diagnostic work on place value, decomposition, and fact relationships.

Subtraction also moved toward Developing, but nearly half of the reported cases remained Emerging. Subtraction places greater demands on inverse reasoning, regrouping, and the interpretation of comparison and missing-part situations. Instruction should therefore connect take-away, comparison, and missing-addend meanings through base-ten representations and number lines rather than rely primarily on a written algorithm.

Because the categories are quarterly aggregates, the shifts should be treated as progress signals rather than intervention effects. Matched item-level evidence is needed to determine which learners moved, which misconceptions persisted, and whether the two quarter assessments were equivalent in difficulty.

3.2 Quarterly Performance in Multiplication and Division

The higher-order operations remained concentrated in the lower proficiency categories.

Table 3. Reported Quarterly Performance Categories for Multiplication and Division

Operation	Quarter	Emerging	Developing	Anchoring	Transforming
Multiplication	Third	17 (36%)	0	30 (64%)	0
Multiplication	Fourth	27 (57%)	4 (9%)	5 (11%)	0
Division	Third	10 (21%)	2 (4%)	35 (74%)	0
Division	Fourth	30 (64%)	4 (9%)	13 (28%)	0

The multiplication profile did not show the same favorable modal movement as addition. The fourth-quarter source entries are incomplete relative to the stated total, so the displayed counts cannot support a complete distributional claim. Even so, the reported concentration in Emerging indicates a need to develop equal-groups, arrays, skip-counting, and distributive reasoning before emphasizing fact speed.

Division similarly shifted from a reported Anchoring majority to an Emerging majority. Learners may confuse sharing and grouping interpretations or fail to connect division with multiplication. Classroom tasks should use concrete sets, drawings, unknown-factor equations, and remainder interpretation, with deliberate comparison of the two meanings of division.

The apparent regression may also reflect differences in assessment difficulty or the later introduction of conceptually demanding content. A common vertical scale and matched learners are necessary before concluding that competence declined.

3.3 Reported Tests of Quarterly Difference

The source retained the null decision for all four operations.

Table 4. Kruskal–Wallis Results as Reported

Operation	Reported H	Source Decision	Journal Interpretation
Addition	.79	Not significant	No exact p reported
Subtraction	.62	Not significant	No exact p reported
Multiplication	2.28	Not significant	No exact p reported
Division	9.13	Not significant	No exact p reported

The four quantities are presented as H statistics, not p-values. The source decision was non-significant for every operation, but exact probabilities, degrees of freedom, and sample structure were not reported. The evidence therefore does not warrant claims of statistically verified quarter improvement.

Non-significance is not proof of equivalence or absence of educational change. Power, incomplete cells, aggregation, and assessment comparability can affect the result. Reporting medians, rank sums, effect sizes, confidence intervals, and matched learner transitions would make the analysis more informative.

3.4 Extent of Mathematics Improvement Activities

Instructional and environmental supports were prominent; parental involvement was the clearest relative gap.

Table 5. Summary of Activities Employed

Activity Domain	Mean	Interpretation	Rank
Quality of instruction	4.44	Much Employed	1
Favorable learning environment	4.25	Much Employed	2
Student engagement and motivation	4.20	Much Employed	3
Use of mathematics resource kits	3.69	Much Employed	4
Parental involvement	2.97	Employed	5
Overall	3.91	Much Employed	—

Quality of instruction ranked first, consistent with the central role of explanation, representation, questioning, pacing, and feedback. The favorable learning environment and engagement ratings suggest that teachers also recognized the importance of safe participation and active practice. These strengths should be documented through lesson artifacts and observation rather than assumed from ratings alone.

Resource-kit use was favorable but lower. A kit contributes only when its contents are complete, accessible, aligned with the lesson, and accompanied by tasks that connect manipulatives to symbols. District monitoring should therefore assess usability, replacement, teacher fluency, and learner access rather than simply inventorying materials.

Parental involvement was the only domain rated merely Employed. A realistic response is a small set of multilingual, low-cost home routines with clear directions and optional formats. Schools should monitor reach and barriers, avoid penalizing learners whose adults have limited time or confidence, and provide equivalent school-based practice.

3.5 Concordance in Activity Rankings

Agreement was strongest for resource kits and significant for four of the five domains.

Table 6. Kendall Concordance for Improvement Activities

Activity Domain	W	χ^2	Reported Decision
Quality of instruction	.29	13.05	Not significant
Engagement and motivation	.68	34.00	Significant
Parental involvement	.64	35.20	Significant
Mathematics resource kits	.79	31.60	Significant
Favorable learning environment	.65	32.50	Significant

The high concordance for resource kits indicates a stable ordering of specific practices across clusters, while significant concordance for engagement, family involvement, and environment suggests shared district priorities. These common patterns can support district-wide minimum standards and resource planning.

Instructional quality showed low and non-significant concordance. This does not mean quality was weak—the mean was the highest—but that clusters did not rank its indicators consistently. The distinction is important: a favorable average can coexist with substantial variation in which practices are emphasized. Moderated lesson study, common observation rubrics, and analysis of learner work can help develop a shared instructional language.

3.6 Integrated Interpretation of the Findings

The evidence depicts an uneven numeracy profile. Addition and subtraction showed more promising descriptive movement than multiplication and division, while formal tests were reported as non-significant. Improvement planning should therefore be operation-specific rather than based on a single overall mathematics label.

Teachers reported strong instructional, engagement, and environmental activity, but weaker family participation and less prominent resource-kit use. The gap is not solved by adding isolated activities; it requires coherent alignment among assessed misconceptions, selected representations, guided practice, feedback, and follow-up.

The concordance findings identify where common district action is feasible. Shared priorities are evident for engagement, family participation, kits, and learning environment. Variation in instructional-quality rankings calls for collaborative calibration instead of assuming that the same label represents the same classroom practice.

A defensible theory of improvement is therefore: use common short assessments to identify operation-specific needs; plan explicit and representation-rich instruction; provide differentiated practice; offer accessible home routines; and review matched learner progress every few weeks. Each step should produce evidence that can be audited and refined.

4. Conclusions and Implications

4.1 Conclusions

Grade 2 mathematics performance was operation-specific. Addition showed the clearest favorable descriptive shift, subtraction improved more modestly, and multiplication and division remained areas of concern.

The reported Kruskal–Wallis decisions were non-significant for all operations. Because exact p-values and complete distributional details were unavailable, the quarterly profiles should be used diagnostically rather than as proof of statistically verified improvement.

Teachers reported that mathematics improvement activities were Much Employed overall (M=3.91). Instructional quality was strongest, whereas parental involvement was the principal development priority.

Concordance was significant for engagement, parental involvement, resource kits, and the learning environment, but not for instructional quality. District action should combine common supports with calibration of classroom instructional practice.

4.2 Study Limitations

The cross-sectional design describes conditions during the stated school year and cannot establish temporal or causal effects. Ratings of effectiveness, competence, or implementation are therefore interpreted as respondent perceptions rather than independently verified improvements in learner performance.

The principal measures were researcher-made, self-report scales. Social desirability, recall, common-method variance, and differences in interpretation of the response anchors may have influenced the estimates. Classroom observation, document review, learning-resource audits, and learner-level outcome data were not incorporated into the principal analyses.

Kendall's W evaluates concordance in the ordering of indicators. It does not test a respondent-level causal relationship between program implementation and competence, nor does it show that a higher-rated practice produced a learner outcome.

The learner-performance tables were aggregate category summaries and did not provide matched individual transitions. The multiplication table also contained incomplete fourth-quarter counts, and the inferential table omitted exact p-values and sufficient test detail.

4.3 Implications for Practice and Policy

Adopt short common formative checks for each operation and analyze errors by concept, representation, and problem structure—not only by total score.

Use an explicit concrete–representational–abstract sequence for place value, regrouping, equal groups, arrays, sharing, grouping, and inverse relationships, with planned prompts that connect each representation.

Create tiered practice cycles for learners who are Emerging, Developing, Anchoring, or Transforming, with rapid regrouping based on current evidence rather than permanent labels.

Audit mathematics kits for completeness, alignment, storage, replacement, and actual classroom use; pair every material with a documented instructional purpose.

Provide brief, inclusive home numeracy routines and maintain an equivalent school-based option. Use respectful two-way communication to identify access, language, time, and confidence barriers.

5. Policy and Implementation Priorities

Table 7. District Numeracy Improvement Framework

Priority Area	Recommended Direction	Expected Evidence
Assessment	Use common operation-specific checks and error coding every three to four weeks.	Matched learner records; item map; progress trend
Instruction	Plan explicit modeling, representations, mathematical talk, and cumulative practice.	Lesson artifacts; observation evidence; learner work
Differentiation	Regroup learners from current diagnostic evidence and provide targeted tasks.	Intervention roster; dosage; exit evidence
Resources	Standardize usable kits and monitor pedagogical use, maintenance, and access.	Inventory; use log; replenishment record
Family partnership	Offer low-cost, multilingual routines with flexible participation modes.	Reach data; feedback; alternative support
Review	Hold cluster data conferences and verify reporting completeness before decisions.	Validated tables; minutes; action and follow-up log

6. Directions for Future Research

Use matched learner-level pretest and posttest data, common calibrated measures, and complete reporting of effect sizes and confidence intervals.

Test specific instructional components through cluster-randomized or well-matched quasi-experimental designs with implementation-fidelity measures.

Investigate why instructional-quality indicators are ranked differently across clusters through observation, teacher interviews, and lesson-artifact analysis.

Examine the reach and equity of home numeracy activities, including participation barriers and whether school-based alternatives produce comparable practice opportunities.

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