

EFFECTIVENESS OF INCLUSIVE MATH DRILLS IN THE NUMERACY SKILLS OF GRADE 3 PUPILS: BASIS FOR AN INTERVENTION PLAN

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ABSTRACT

This study examined the effectiveness of inclusive math drills in improving the numeracy skills of Grade 3 pupils at Quibaol Elementary School, Lingayen, Pangasinan, during School Year 2025–2026. A quasi-experimental pretest–posttest design was employed with 40 pupils divided into control and experimental groups of 20 pupils each. The experimental group underwent five weeks of inclusive math drills aligned with the MATATAG curriculum, while the control group received regular classroom instruction from the same Grade 3 teacher. Data were gathered through a validated numeracy test administered as a pretest and posttest, a pupil profile sheet, and a survey questionnaire on implementation challenges. Mean, standard deviation, paired-sample t-test, independent-sample t-test, Pearson r, and Spearman rho were used to analyze the data at a 0.05 level of significance. Results showed that the experimental group exhibited a significant improvement in numeracy performance, with mean scores rising from 8.80 to 17.80 ($t = -17.54$, $p < .001$), while the control group showed no significant change ($p = .694$). A significant difference was found between the two groups' posttest scores ($t = 4.005$, $p < .001$). No significant relationship was observed between pupils' demographic profile variables and their posttest numeracy performance. Identified implementation challenges included limited collaboration between general education and SPED teachers and insufficient instructional materials and manipulatives. The study concluded that inclusive math drills were effective in enhancing numeracy skills regardless of pupils' demographic backgrounds, and proposed Project IN-MATH as a structured intervention plan to sustain inclusive numeracy instruction in the school setting.

Keywords: *inclusive math drills, numeracy skills, Grade 3 pupils, quasi-experimental research, pretest-posttest design*

INTRODUCTION

Numeracy is among the foundational competencies that must be prioritized in the early years of formal schooling, given its central role in children's academic confidence and long-term mathematical performance. Grade Three represents a critical developmental juncture at which pupils begin to transition from basic arithmetic to more complex mathematical concepts—including multiplication and introductory fractions—while simultaneously developing problem-solving strategies that require reasoning about numbers and their relationships. Inclusive math drills were designed to address the diverse learning needs present in inclusive classrooms by incorporating differentiated activities, visual and tactile tools, peer support structures, and flexible pacing, making practice accessible to all learners regardless of ability or background (Cull & Travers, 2023; Mokotjo, 2024).

Despite growing evidence of their promise, empirical studies on the use of inclusive math drills at the Grade 3 level in Philippine public elementary schools remained limited, and their effectiveness relative to conventional instruction had not been sufficiently documented. This study aimed to address this gap by determining the effectiveness of inclusive math drills in improving the numeracy skills of Grade 3 pupils at Quibaol Elementary School, Lingayen, Pangasinan, during School Year 2025–2026. Specifically, it investigated pupils' pretest and posttest performance, examined significant differences between and within groups, explored the relationship between demographic profile and posttest performance, identified implementation challenges, and proposed an evidence-based intervention plan.

Statement of the Problem

This study aimed to determine the effectiveness of using inclusive math drills in improving the numeracy skills of Grade Three pupils in Quibaol Elementary School. Specifically, it sought to answer the following questions:

1. What was the profile of Grade 3 pupils in terms of age, gender, average family monthly income, employment of father, employment of mother, and number of siblings?
2. What was the pretest performance of Grade 3 pupils in numeracy skills prior to the implementation of inclusive math drills?
3. What was the posttest performance of Grade 3 pupils in numeracy skills after the implementation of inclusive math drills?
4. Was there a significant difference between the pretest and posttest scores of Grade 3 pupils after being exposed to inclusive math drills?
5. Was there a significant relationship between posttest numeracy performance and the demographic profile of Grade 3 pupils?
6. What problems were encountered in the implementation of inclusive math drills?
7. What intervention plan could be proposed based on the findings of the study?

Scope and Delimitations

This study examined whether inclusive math drills could improve the numeracy skills of Grade 3 pupils at Quibaol Elementary School in Lingayen, Pangasinan, during School Year 2025–2026. The study covered lessons based on the MATATAG curriculum, specifically addition, subtraction, multiplication, and division. The participants were two Grade 3 sections, divided into a control group and an experimental group. The study measured pupils' performance using pre- and posttest results and was limited to Grade 3 pupils and basic arithmetic skills.

REVIEW OF RELATED LITERATURE

Importance of the Development of Numeracy Skills

Numeracy encompasses more than computational skill—it involves the ability to use numbers meaningfully in daily contexts and to reason logically about quantitative information (Devlin, 2021). In the Philippines, studies confirmed that regular practice of basic operations through structured activities led to measurable gains in numeracy proficiency among elementary pupils (Manalaysay, 2021; Lesaca & Falle, 2021). Parental involvement in home-based numeracy activities also contributed to children's mathematical development, though its impact was moderated by socioeconomic constraints (Smith, Jenkins, & Alvarez, 2024). Math anxiety triggered by unsupportive or high-pressure environments remained a significant obstacle to numeracy development, particularly among low-income learners (Wu & Lin, 2023).

Tools and Strategies that Enhance Numeracy

A range of instructional tools and strategies demonstrated effectiveness in developing pupils' numeracy skills. STEM-integrated approaches, physical manipulatives, and digital tools promoted deeper conceptual engagement and improved problem-solving outcomes (Elsayed, 2022; Linaza, Gultiano, & Susada, 2025; Clements & Sarama, 2023). Program-based interventions such as Project COUNTS and the Olympic Integer program produced significant gains in numeracy among Filipino learners in structured, creative drill formats (Munda, Endrinal, & Nequinto, 2024; Alfante, Padlan, & Gutierrez, 2024). AI-powered and technology-assisted drill tools also showed positive results in low-resource environments (Henkel, Mensah, & Osei, 2024). Active, movement-based activities further reduced math anxiety and improved focus, especially among learners with special needs (Education Sciences, 2025).

Effectiveness of Inclusive Math Drills

Inclusive math drills, designed to accommodate learners of varying abilities through differentiation, peer support, and adaptive content, were validated in multiple international and local studies. Vanbecelaere et al. (2020) found that personalized digital math games significantly improved early numeracy for both beginning and advanced learners. Graven (2024) documented that structured math club activities in South African schools improved number sense and pupil confidence. In inclusive classroom settings, co-teaching structures that paired general and SPED teachers during math drills produced significant gains for pupils with learning disabilities (Cull & Travers, 2023). Participatory action research by Mokotjo (2024) confirmed that inclusive, interactive math activities improved performance, attitude, and self-confidence among learners with dyscalculia. Classwide Peer Tutoring (Greenwood & Delquadri, 2023) further demonstrated the effectiveness of inclusive structures in promoting mathematical learning. Local Philippine studies consistently reinforced these findings: contextualized drill cards improved Grade 3 numeracy scores (Rue, Deseo, & Prodigalidad, 2025); gamified drills increased motivation and performance in basic operations (Cruz & Santos, 2023); and structured, repetitive drills strengthened numeracy and confidence in public school settings (Santos et al., 2024).

METHODOLOGY

Research Design

This study employed a quantitative descriptive and quasi-experimental pretest-posttest research design. The descriptive component profiled the Grade 3 pupils in terms of demographic variables, while the quasi-experimental component compared pretest and posttest numeracy performance between a control group and an experimental group.

Data Collection and Sample Selection

The study was conducted at Quibaol Elementary School in Lingayen, Pangasinan during School Year 2025–2026. A total of 40 Grade 3 pupils participated through complete enumeration, divided into an experimental group exposed to inclusive math drills and a control group that received regular instruction. Data were gathered using a pupil profile sheet, a validated numeracy test administered as a pretest and posttest, and a survey questionnaire to identify implementation challenges. The intervention was conducted over five weeks.

Data Analysis Methods

The data were analyzed using both descriptive and inferential statistics. Frequency and percentage were used to describe the pupils' demographic profile. Mean and standard deviation were utilized to determine numeracy performance levels. A paired-samples t-test was used to assess differences between pretest and posttest scores, while an independent t-test was used to compare the two groups' performance. Pearson r and Spearman rho were used to assess relationships between pupils' profiles and their performance. A 0.05 level of significance was used in testing the hypotheses.

Ethical Considerations

The study followed proper ethical standards to protect the rights, safety, and dignity of the participants. Permission was obtained from the Schools Division Superintendent, Public Schools District Supervisor, and the school head before conducting the study. Informed consent from parents or guardians and assent from the pupils were secured. Confidentiality was maintained by not using names and by securing all data. Both control and experimental groups received proper instruction, with no pupil deprived of learning.

RESULTS AND DISCUSSION

Profile of the Subjects of the Study

Both groups were equivalent in gender composition, with 8 males (40%) and 12 females (60%) in each group. The experimental group was predominantly 7 years old (50%), while the control group was mostly 8 years old (70%). Socioeconomic disparities were notable: 50% of the experimental group came from families earning less than ₱5,000 per month, compared to 30% in the control group. A larger proportion of fathers in the control group held full-time employment (45% vs. 25%). These differences suggested that the experimental group came from more economically disadvantaged backgrounds, making the intervention both contextually relevant and necessary.

Table 1. Pretest and Posttest Performance of Control and Experimental Groups

Statistic	Control Pretest	Control Posttest	Experimental Pretest	Experimental Posttest
Minimum	4	4	4	12
Maximum	25	25	18	29
Mean	11.15	11.35	8.80	17.80
Std. Deviation	5.11	5.21	4.36	4.97
Skewness	0.88	0.78	0.96	0.90
Kurtosis	1.33	1.03	-0.08	0.26

The control group showed virtually no improvement, with mean scores moving from 11.15 to 11.35. The experimental group, in contrast, demonstrated a substantial gain from a pretest mean of 8.80 to a posttest mean of 17.80, representing a mean difference of 9.00 points.

Table 2. Performance Level Distribution by Group and Testing Period

Level	Score Range	Ctrl Pretest n (%)	Ctrl Posttest n (%)	Exp Pretest n (%)	Exp Posttest n (%)
Highly Numerate	23–30	1 (5%)	1 (5%)	0 (0%)	3 (15%)
Moderately Numerate	12–22	8 (40%)	8 (40%)	4 (20%)	17 (85%)
Non-Numerate	0–11	11 (55%)	11 (55%)	16 (80%)	0 (0%)

The control group's performance levels remained unchanged, while the experimental group shifted completely: 80% began as Non-Numerate, yet after the intervention, none remained Non-Numerate, 85% advanced to Moderately Numerate, and 15% reached the Highly Numerate level. This shift confirmed the transformative impact of inclusive math drills on learner performance (Munda, Endrinal, & Nequinto, 2024; Rue, Deseo, & Prodigalidad, 2025).

Table 3. Significant Difference Between Pretest and Posttest Scores

Group	Pretest M (SD)	Posttest M (SD)	Mean Diff	t	p
Control	11.15 (5.11)	11.35 (5.21)	-0.20	-0.40	0.694 (ns)
Experimental	8.80 (4.36)	17.80 (4.97)	-9.00	-17.54	0.000*
Between-Group Posttest	—	—	6.45	4.005	0.000*

*Significant at $p < .05$; ns = not significant

The paired-sample t-test for the experimental group yielded a statistically significant result ($t = -17.54$, $p < .001$), confirming that the improvement from pretest to posttest was attributable to the intervention. The control group showed no significant change ($t = -0.40$, $p = .694$). The independent-samples t-test comparing posttest scores between groups was also significant ($t = 4.005$, $p < .001$), with the experimental group scoring 6.45 points higher on average (Burns et al., 2025; Lindström Sandahl et al., 2024).

Table 4. Relationship Between Posttest Performance and Pupil Profile

Profile Variable	Statistical Test	r / ρ / rpb	p-value	Interpretation
Age	Spearman ρ	0.093	0.695	Not Significant
Gender	Point-Biserial	0.367	0.112	Not Significant
Avg. Family Monthly Income	Spearman ρ	0.205	0.385	Not Significant
Employment Status – Father	Point-Biserial	-0.117	0.623	Not Significant
Employment Status – Mother	Point-Biserial	0.135	0.571	Not Significant
Number of Siblings	Spearman ρ	-0.037	0.877	Not Significant

None of the profile variables showed a statistically significant relationship with posttest numeracy performance (all $p > .05$). This finding affirmed the inclusive and equitable nature of the intervention, consistent with the findings of Cull and Travers (2023) and Mokotjo (2024).

Table 5. Problems Encountered in Implementing Inclusive Math Drills

Category	Subtotal Mean	Interpretation
Learner-Related Challenges	2.60	Occasionally Encountered
Teacher-Related Challenges	2.40	Seldom Encountered
Resource and Environmental Challenges	2.40	Seldom Encountered
Overall Mean	2.47	Seldom Encountered

Scale: 4.50–5.00 = Always; 3.50–4.49 = Frequently; 2.50–3.49 = Occasionally; 1.50–2.49 = Seldom; 1.00–1.49 = Never

The overall mean of 2.47 indicated that implementation challenges were seldom encountered. However, two items stood out: limited collaboration between general education and SPED teachers (WM = 5.00, Always Encountered) and shortage of instructional materials and manipulatives (WM = 4.00, Frequently Encountered). These systemic challenges must be addressed to sustain and scale inclusive numeracy instruction (Friend & Cook, 2023; Mitchell, 2024).

Proposed Intervention Plan: Project IN-MATH

(Inclusive Numeracy through Math Drills and Holistic Support)

The study revealed that inclusive math drills significantly improved the numeracy skills of Grade 3 pupils. However, key challenges were identified, particularly limited collaboration between general education and SPED teachers, shortage of instructional materials and manipulatives, and learners' varied pacing and short attention span. Project IN-MATH was designed to sustain and further enhance the numeracy skills of learners through structured inclusive math drills, strengthened collaboration among teachers, and improved instructional support.

The general objective was to enhance and sustain the numeracy skills of Grade 3 pupils through strengthened inclusive math drills, improved teacher collaboration, and adequate instructional support. Primary beneficiaries were the Grade 3 pupils of Quibaol Elementary School. Secondary beneficiaries included mathematics teachers, SPED teachers, and school administrators.

SUMMARY

The study found that inclusive math drills were effective in improving the numeracy skills of Grade 3 pupils at Quibaol Elementary School for School Year 2025–2026. Most pupils in both groups started with low numeracy levels, but the experimental group had lower initial scores. After five weeks, the experimental group showed a significant improvement in scores and shifted from mostly Non-Numerate to mainly Moderately Numerate and some Highly Numerate, while the control group showed only minimal improvement. Statistical analysis confirmed that the experimental group's improvement was significant, while the control group showed no significant change. No significant relationship was found between pupils' posttest performance and profile variables. The most critical implementation

challenges were the lack of collaboration between general and SPED teachers and the shortage of instructional materials and manipulatives.

CONCLUSIONS

The study concluded that Grade 3 pupils at Quibaol Elementary School came from diverse backgrounds in terms of age, family income, and parents' employment, but both groups had similar gender distributions and were mostly female. Before the intervention, both groups showed low numeracy skills. After the implementation of inclusive math drills, the experimental group showed a marked improvement in numeracy performance, with all pupils moving out of the non-numerate level. The findings confirmed that inclusive math drills were effective, as shown by significant improvements within the experimental group and a clear difference between groups. Pupils' background characteristics were not significantly related to their posttest performance, indicating that the intervention benefited learners regardless of personal or socioeconomic background. Limited collaboration between general education and SPED teachers and the lack of adequate instructional materials were the primary implementation challenges that should be addressed to further improve the effectiveness of inclusive instruction.

RECOMMENDATIONS

Based on the findings and conclusions, the following were recommended:

1. Teachers were encouraged to regularly use inclusive math drills in their daily lessons, given their effectiveness in improving numeracy skills of Grade 3 pupils.
2. School heads and curriculum coordinators may support the use of differentiated instruction so that pupils with different learning needs are properly accommodated.
3. School administrators were advised to strengthen collaboration between general education and SPED teachers through regular planning or co-teaching to improve inclusive instruction.
4. The school may also provide more instructional materials and manipulatives, while teachers were encouraged to create low-cost and innovative learning tools.
5. Future researchers were encouraged to conduct similar studies with more participants, longer duration, and other grade levels.

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