

Effectiveness of Numeracy Intervention Program in Improving Basic Mathematical Skills among Non-Numerate Students

Melinda P. Pondevida, MAEd

Graduate Student, Tomas Claudio Colleges, Morong, Rizal Philippines

Teacher I, Antipolo National High School, Antipolo City Philippines

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Email of Corresponding Author: melinda.pondevida@deped.gov.ph

Abstract

This study examined the effectiveness of the Numeracy Intervention Program in improving basic mathematical skills among non-numerate Grade 7 students at Tomas Claudio Colleges, Morong, Rizal. Utilizing an experimental research design, specifically a single-group pretest–posttest approach, the study aimed to determine whether structured numeracy interventions significantly enhance learners’ mathematical performance. The respondents were described in terms of age, sex, sibling position, family size, parents’ educational attainment, occupation, and monthly income. Data were gathered through validated assessment tools and analyzed using mean, standard deviation, paired t-test, and analysis of variance (ANOVA). Findings revealed that most respondents were 13-year-old male students from medium to large families and belonged to lower-middle to middle-income households. Prior to the intervention, learners demonstrated low mathematical performance with a mean score of 10.70. After exposure to the Numeracy Intervention Program, results showed a marked improvement with a mean score of 19.42, indicating that all participants reached at least a satisfactory level. The decrease in score variability further suggested more consistent learning outcomes. The paired t-test confirmed a statistically significant difference between pretest and posttest scores, establishing the effectiveness of the intervention. ANOVA results indicated that socio-demographic variables such as age, sex, sibling position, family size, and parents’ education and occupation did not significantly influence posttest performance. However, monthly family income showed a significant effect on learner improvement. The study concludes that the Numeracy Intervention Program is effective in enhancing basic mathematical skills among non-numerate students and is applicable across diverse learner backgrounds. It is recommended that schools integrate structured intervention programs into the mathematics curriculum, strengthen teacher training, and enhance parental support to sustain learner progress and improve numeracy outcomes. Implications for policy and classroom practice are also discussed in relation to equitable learning outcomes in education

Keywords: Numeracy Intervention, Mathematical Skills, Grade 7 Students, Experimental Research, Pretest-Posttest Design, Non-Numerate

Introduction

Education is widely recognized as a fundamental pillar of national development and a powerful catalyst for social transformation. It plays a crucial role in fostering economic growth, promoting social equity, and enhancing the overall well-being of individuals and communities. By equipping learners with essential knowledge, skills, attitudes, and values, education empowers individuals to think critically, solve complex problems, and adapt to the rapidly changing demands of society. More importantly, it nurtures responsible and productive citizens who actively contribute to nation-building and sustainable development. An educated populace serves as the backbone of innovation, entrepreneurship, and productivity. Through education, individuals gain the competence necessary to participate meaningfully in economic activities, thereby contributing to national progress. Thus, the quality of education remains a vital determinant of a country’s developmental trajectory.

In the Philippines, the importance of education is enshrined in Article XIV, Section 2 of the 1987 Philippine Constitution, which mandates that the State shall establish, maintain, and support a complete, adequate, and integrated system of education relevant to the needs of the people and society. This provision underscores the right of every Filipino learner to access quality education and emphasizes the government’s responsibility to ensure equitable learning opportunities. In response, the Department of Education (DepEd) continuously implements reforms, programs, and assessments aimed at improving learner outcomes and strengthening instructional delivery across all learning areas.

One of the critical competencies emphasized in basic education is numeracy, which serves as a foundation for learning across disciplines. Numeracy skills, particularly in the four fundamental operations—addition, subtraction, multiplication, and division—are essential for academic success in Mathematics and other subjects that require logical reasoning and

problem-solving. Learners who struggle with numeracy often experience difficulties not only in Mathematics but also in Science and other analytical subjects, resulting in lower academic engagement and achievement.

Recent educational trends highlight the need for data-driven instruction and targeted intervention programs to address learning gaps in Mathematics. DepEd initiatives such as large-scale assessments, including the Early Language, Literacy, and Numeracy Assessment (ELLNA) and the National Achievement Test (NAT), reflect the government's commitment to monitoring learning outcomes and improving instructional effectiveness. These assessments provide critical data for identifying learners who require remediation and support.

Several studies have highlighted the effectiveness of structured intervention programs in improving learners' mathematical performance. Stevens et al. (2023) conducted a meta-analysis of mathematics interventions and found that such programs yield moderate to strong positive effects on student achievement, particularly when interventions are sustained over time. Their findings emphasize the importance of structured, long-duration instructional support, which is highly relevant to the present study's focus on a Numeracy Intervention Program for Grade 7 learners.

Similarly, Aunio et al. (2021) demonstrated that early numeracy intervention significantly improves learners' foundational skills, especially among at-risk students. Although their study focused on younger learners, the results reinforce the importance of early and structured support in addressing numeracy difficulties, which aligns with the objectives of the current research. Purnomo et al. (2022) further emphasized the role of assessment tools in improving numeracy skills, showing that well-designed instruments not only measure performance but also contribute to learning development. This supports the present study's emphasis on structured evaluation as part of intervention programs. Blume et al. (2021) confirmed that basic numerical abilities strongly predict academic performance in Mathematics, highlighting the importance of strengthening foundational skills to improve long-term achievement. This finding supports the rationale for focusing on non-numerate learners in the present study.

In the local context, Apus and Quirap (2024) found that learner attitudes and parental influence significantly affect Mathematics performance. Their study underscores the importance of supportive learning environments, which complements the need for intervention programs that address both cognitive and contextual factors in learning. Legal and Legal (2024) demonstrated that remedial instruction significantly improves numeracy performance among Grade 7 students, with post-test results showing substantial gains. This provides strong evidence for the effectiveness of targeted remediation programs similar to the intervention used in the present study. Furthermore, Francisco et al. (2025) found a significant relationship between numeracy skills and academic performance, reinforcing the idea that strengthening basic skills leads to improved overall achievement in Mathematics.

Despite the growing body of literature supporting numeracy interventions and remedial instruction, several gaps remain evident. First, many studies focus on early grade levels or broader mathematics achievement without isolating non-numerate junior high school learners, particularly Grade 7 students transitioning into more complex mathematical concepts. Second, while existing research confirms the effectiveness of intervention programs, limited studies examine structured, school-based numeracy intervention programs implemented within a localized Philippine context using experimental designs.

Moreover, there is insufficient evidence on how such interventions perform across diverse socio-demographic profiles within a single-group experimental framework. Although some studies suggest the influence of socio-economic factors, there is still a need to clarify whether structured intervention programs can minimize these disparities and ensure equitable learning outcomes.

Given these gaps, the present study focuses on determining the effectiveness of a Numeracy Intervention Program in improving the basic mathematical skills of non-numerate Grade 7 students. By employing an experimental research design, this study aims to provide empirical evidence on the extent to which structured intervention can enhance numeracy performance regardless of learners' background. Ultimately, the findings are expected to contribute to improved instructional practices, more effective remediation strategies, and enhanced learner achievement in Mathematics.

Material and methods

2.1 Research Design

The study employed an experimental research method utilizing a single-group pretest–posttest design

2.2 Locale of the Study

The study was conducted in Antipolo National High School. This is one of the public secondary schools in the City Schools Division Office of Antipolo. The school offers complete high school education from grade 7 to grade 10

2.3 Respondents of the Study

The respondents of the study consisted of fifty (50) identified Grade 7 students who were experiencing difficulty in Mathematics in the selected school.

2.4 Sample and Sampling Procedure

The respondents were chosen through purposive sampling based on the results of a diagnostic Mathematics test administered to assess their level of mathematical performance. Only those who were identified as non-numerate or low-performing in Mathematics were included in the study to ensure that the intervention directly addressed learners who needed remediation. The respondents were further described in terms of relevant profile variables, including age, sex, sibling position, number of children in the family, parents' educational attainment, parents' occupation, and monthly family income. This sampling procedure ensured that the study focused on the most appropriate participants for the Numeracy Intervention Program and allowed for a comprehensive analysis of how learner and family characteristics relate to their mathematical performance.

2.5 Research Instrument

The study utilized a researcher-made pretest and posttest as the main instruments to measure the basic mathematical skills of Grade 7 students experiencing difficulty in Mathematics. Both tests consisted of 25 items and were administered before and after the implementation of the Numeracy Intervention Program to determine its effectiveness in improving learners' performance. Each student was provided with an individual copy of the test to ensure accuracy and consistency in data collection. The results were interpreted using a five-point scale ranging from 0–9 (Did Not Meet Expectations) to 25 (Outstanding), with corresponding verbal interpretations from Fairly Satisfactory to Very Satisfactory and Outstanding. To ensure validity and reliability, the instrument was developed based on the Table of Specifications aligned with the curriculum and was content-validated by the Head Teacher of the Mathematics Department, a Master Teacher I, and the Numeracy Coordinator. It was also pilot tested to 25 learners from Antipolo National High School who were not part of the actual study. Reliability was established using the split-half method (odd–even technique), yielding a Pearson r value of 0.97, indicating a very strong positive correlation. Further computation using the Spearman–Brown Prophecy Formula produced a reliability coefficient of 0.98, signifying very high internal consistency. These results confirm that the instrument is valid, reliable, and appropriate for measuring learners' numeracy skills before and after the intervention.

2.6 Data Gathering Procedure

In the conduct of the study, a Gantt Chart of Activities was followed. The instrument was subjected to content-validation and reliability testing. Then, permission to conduct the study was sought from the Schools Division Superintendent of the City Schools Division Office of Antipolo. Afterwards, pretest was administered to the grade 7 students. The students who find difficulty in Mathematics were identified and they were given remedial instruction for one month in the form of numeracy intervention program, then, they were given a posttest. Data gathered were analyzed and interpreted based on the sub-problems using Statistical Package in Social Sciences. Afterwards, summary of findings, conclusions and recommendations were formulated. The researcher was guided by the provision of the Data Privacy Act in the conduct of this study. After the oral defense, revision of the manuscript was based on the comments, suggestions and recommendations given by the Oral Examination Panel. The manuscript was also subjected to anti-plagiarism test at the statistical center. The manuscript underwent final revision, editing and bookbinding. Afterwards, hardbound copies were submitted to the Office of the Dean of the Graduate Studies Program and other offices concerned.

2.7 Data Analysis Techniques

The data gathered in the study were analyzed and interpreted using appropriate statistical tools aligned with the research objectives. To describe the profile of the respondents in terms of selected variables, frequency, percentage, and rank distribution were used. To determine the level of mathematical performance of the Grade 7 students before and after exposure to the Numeracy Intervention Program, as reflected in the pretest and posttest results, frequency, percentage, mean, and standard deviation were applied. To test whether a significant difference exists between the pretest and posttest scores of the respondents, a dependent t-test was employed. Furthermore, to determine if there is a significant difference in the posttest performance of the respondents when grouped according to their profile variables, a one-way analysis of variance (ANOVA) was utilized. These statistical tools provided a systematic and objective basis for analyzing the effectiveness of the Numeracy Intervention Program in improving the basic mathematical skills of the respondents.

2.8 Ethical Considerations

This study strictly adhered to ethical standards in the conduct of research. Prior to data collection, permission was sought from the school authorities and concerned officials to ensure proper coordination and approval. The respondents were

informed about the purpose of the study, and their participation was entirely voluntary. Informed consent was obtained, assuring them that they could withdraw from the study at any time without any consequences. Confidentiality and anonymity of the respondents were strictly maintained by not disclosing their identities and ensuring that all collected data were used solely for academic purposes. Additionally, the researcher ensured that no harm, discomfort, or bias would affect the participants throughout the process. All information gathered was treated with utmost respect and integrity, and results were presented honestly and objectively.

Results and Discussion

3.1 Profile of the Two Groups of Respondents in Terms of the Selected Variables

As shown in the table, out of 50 respondents, 46% are 13 years old, with 62% of them are male while 38% are female. As to their sibling position, 36% are 3rd born in the family, while 12% of them are first born. In terms of the number of children in the family, 34% have 3 children in the family while 1 or 2% has 1 child in the family. As to their parent educational attainment, most of the fathers are college graduate and high school graduate with the same percentage of 32 while only 1 or 2% is an elementary graduate, for the mothers, most of them are college graduate with 38% while only 1 or 2% is an elementary graduate. For the parent occupation, most of the fathers are self-employed with 50%, while the mothers are also self-employed with 46% having a monthly family income between Php 15,001 – Php 22,000 and Php 8,001 – Php 15,000 respectively are 40%.

Table 1.1.
*Frequency and Percentage Distribution of the Respondents
in Terms of the Selected Variables*

Age	f	%	Rank			
11 years old	1	2.0	4			
12 years old	16	32.0	2			
13 years old	23	46.0	1			
14 years old	10	20.0	3			
Total	50	100.0				
Sex						
Male	31	62.0	1			
Female	19	38.0	2			
Total	50	100.0				
Sibling Position						
1 st	6	12.0	5			
2 nd	9	18.0	3			
3 rd	18	36.0	1			
4 th	10	20.0	2			
5 th and above	7	14.0	4			
Total	50	100.0				
Number of Children in the Family						
1	1	2.0	5			
2	5	10.0	4			
3	17	34.0	1			
4	11	22.0	3			
5 and above	16	32.0	2			
Total	50	100.0				
Parent's Educational Attainment	Father			Mother		
	f	%	Rank	f	%	Rank
College Graduate	16	32.0	1.5	19	38.0	1
College Undergraduate	13	26.0	3	10	20.0	3
High School Graduate	16	32.0	1.5	14	28.0	2
High School Undergraduate	4	8.0	4	3	6.0	4.5
Elementary graduate	1	2.0	5	3	6.0	4.5
Elementary undergraduate	-	-	-	1	2.0	6
Total	50	100.0		50	100.0	
Parent's Occupation	Father			Mother		
	f	%	Rank	f	%	Rank
Government Employee	3	6.0	4	1	2.0	5

Private Employee	13	26.0	2	11	22.0	2
Self-employed	25	50.0	1	23	46.0	1
OFW	2	4.0	5	6	12.0	4
Others	7	14.0	3	9	18.0	3
Total	50	100.0		50	100.0	
Monthly Family Income						
Php 22,001 and above	7		14.0		3	
Php 15,001 – Php 22,000	20		40.0		1.5	
Php 8,001 – Php 15,000	20		40.0		1.5	
below Php 8,000	3		6.0		4	
Total	50		100.0			

3.2 Level of Mathematical Performance of the Respondents Before and After Exposure to Numeracy Intervention Program as Revealed in the Pretest and Posttest Results

The table shows that prior to the intervention, most of the learners were classified in the lower performance levels. Specifically, 44% of the respondents were categorized as Did Not Meet Expectation, 40% were in the Fairly Satisfactory level, and only 16% achieved a Satisfactory rating. The computed mean score in the pretest was 10.70 with a standard deviation of 3.406, indicating generally low mastery of basic mathematical skills. After the implementation of the numeracy intervention program, a notable improvement in performance was observed. In the posttest, 54% of the learners reached the Satisfactory level while 46% attained the Very Satisfactory level. The mean score increased to 19.42 with a lower standard deviation of 2.071, and none of the learners remained in the lower categories. The results indicate that the numeracy intervention program contributed to a significant improvement in the respondents' mathematical performance. The shift of learners from the lower performance categories to higher levels suggests that the intervention helped strengthen their understanding of basic mathematical concepts and operations. The increase in the mean score and the improvement in the minimum and maximum scores further demonstrate that students developed better numeracy competencies after participating in the intervention sessions. Moreover, the decrease in the standard deviation implies that the students' scores became more consistent, indicating that the majority of learners benefited from the program. These findings are supported by the study of Munda et al., (2024) who found that structured numeracy intervention programs significantly improved students' mathematical performance and helped move learners from lower achievement levels to higher levels of competency. Their study emphasized that targeted and systematic instructional support can effectively enhance students' numeracy skills.

Table 2

Level of Mathematical Performance of the Respondents Before and After Exposure to Numeracy Intervention Program as Revealed in the Pretest and Posttest Results

Performance		Pretest		Posttest	
Scores	Verbal Interpretation	Frequency	Percent	Frequency	Percent
25	Outstanding	-	-	-	-
20-24	Very Satisfactory	-	-	23	46
15-19	Satisfactory	8	16	27	54
10-14	Fairly Satisfactory	20	40	-	-
0-9	Did Not Meet Expectation	22	44	-	-
Total		50	100	50	100
Mean		10.70		19.42	
Std. Deviation		3.406		2.071	
Minimum		6		16	
Maximum		19		23	

3.3 Significant Difference on the Level of Mathematical Performance of the Respondents Before and After Exposure to Numeracy Intervention Program as Revealed in the Pretest and Posttest Results

The results revealed a significant improvement in the mathematical performance of the respondents after exposure to the Numeracy Intervention Program. The mean score increased from 10.70 in the pretest to 19.42 in the posttest, while the standard deviation decreased from 3.406 to 2.071, indicating not only higher performance but also more consistent results among learners. The computed t-value of -20.390 with 49 degrees of freedom and a p-value of .000 confirmed that there is a statistically significant difference between the pretest and posttest scores, leading to the rejection of the null hypothesis. These findings demonstrate that the intervention program was effective in enhancing the basic numeracy skills of non-

numerate Grade 7 students. The improvement suggests that structured and targeted instructional strategies, along with guided practice, can significantly address learning gaps in Mathematics. Furthermore, the reduced variability in scores implies that the program benefited the majority of learners, promoting more uniform achievement levels. This result supports the effectiveness of intervention-based approaches and aligns with the findings of Legal and Legal (2024), which also reported significant improvements in numeracy skills following remedial instruction.

Table 3

Significant Difference on the Level of Mathematical Performance of the Respondents Before and After Exposure to Numeracy Intervention Program as Revealed in the Pretest and Posttest Results

	Mean	Sd.	Mean Diff.	t	df	Sig	Ho	VI
Pretest	10.70	3.406	1.335	-20.390	49	.000	Rejected	Significant
Posttest	19.42	2.071						

3.4 Significant Difference on the Level of Mathematical Performance of the Respondents After Exposure to Numeracy Intervention Program as Revealed in the Posttest Results in Terms of their Profile

The results indicate that most of the respondents' profile variables—age, sex, sibling position, number of children in the family, parents' educational attainment, and parents' occupation—did not show significant differences in posttest performance, as their p-values exceeded the 0.05 level of significance. This led to the acceptance of the null hypothesis for these variables, suggesting that the Numeracy Intervention Program was equally effective across diverse learner characteristics. However, monthly family income yielded a statistically significant result ($F = 2.852$, $p = .047$), leading to the rejection of the null hypothesis for this variable. This finding implies that while the intervention program provided equitable opportunities for improving mathematical skills, socioeconomic factors may still influence the extent of learners' academic gains. Learners from higher-income families may benefit from additional resources, support systems, or more conducive learning environments that reinforce school-based instruction. These results suggest that although structured numeracy interventions are broadly effective, schools should consider providing additional academic support to learners from lower-income backgrounds to ensure more inclusive and equitable learning outcomes. This finding is consistent with the study of Francisco et al. (2025), which highlighted that most demographic factors do not significantly affect learners' performance after intervention, emphasizing the effectiveness of well-designed instructional strategies, while also pointing to the need for further research on other influencing factors.

Table 4

Computed F-values on the Level of Mathematical Performance of the Respondents After Exposure to Numeracy Intervention Program as Revealed in the Posttest Results in Terms of Their Profile

Variables	F	p-values	Ho	VI
Age	.638	.594	Accepted	Not Significant
Sex	.019	.892	Accepted	Not Significant
Sibling Position	1.027	.404	Accepted	Not Significant
Number of Children in the Family	1.046	.403	Accepted	Not Significant
Fathers' Educational Attainment	.466	.761	Accepted	Not Significant
Mothers' Educational Attainment	1.012	.422	Accepted	Not Significant
Fathers' Occupation	1.576	.197	Accepted	Not Significant
Mothers' Occupation	.979	.429	Accepted	Not Significant
Monthly Family Income	2.852	.047	Rejected	Significant

Conclusion & Recommendations

The study concludes that the Numeracy Intervention Program is effective in enhancing the basic mathematical skills of non-numerate students, as evidenced by the significant improvement in their performance after the intervention. The program proved to be inclusive and effective across various learner characteristics such as age, sex, sibling position, family size, and parents' educational attainment and occupation, indicating that it can be applied to diverse groups of learners. However, monthly family income was found to be a significant predictor of students' mathematical performance, suggesting that socioeconomic factors may still influence the extent of learners' improvement despite the effectiveness of the intervention.

In light of these findings, it is recommended that curriculum planners integrate structured and evidence-based numeracy intervention programs into the regular Mathematics curriculum to support struggling learners and promote equitable academic outcomes. School administrators should provide continuous professional development, resources, and monitoring systems to sustain the implementation of such programs. Teachers are encouraged to strengthen intervention

strategies focusing on foundational skills and targeted remediation, while students should actively engage in intervention activities to further develop their competencies. Parents and guardians, particularly those from low-income households, are also encouraged to provide academic support at home. The proposed action plan is recommended for implementation, and future researchers are advised to conduct similar studies with larger samples and broader variables to further validate the effectiveness of numeracy intervention programs and explore their long-term impact.

Compliance with ethical standards

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REFERENCES

- Apus, R. M., & Quirap, J. D. (2024). Learner attitudes and parental influence on mathematics performance among junior high school students. *Philippine Journal of Educational Research*, 18(1), 45–58.
- Aunio, P., Räsänen, P., & Korhonen, J. (2021). Early numeracy intervention and its impact on children at risk for mathematical learning difficulties. *International Journal of Early Childhood Education*, 27(2), 123–138. <https://doi.org/10.1007/s13158-021-00285-4>
- Blume, F., Zuber, J., & Dresler, T. (2021). Basic numerical abilities as predictors of mathematical achievement: A longitudinal study. *Learning and Instruction*, 71, 101–112. <https://doi.org/10.1016/j.learninstruc.2020.101112>
- Francisco, L. M., Santos, P. R., & Dela Cruz, A. J. (2025). Influence of numeracy skills on academic performance among secondary school learners. *Journal of Mathematics Education Research*, 20(1), 67–82.
- Legal, M. A., & Legal, C. P. (2024). Effectiveness of remedial instruction in improving numeracy skills of Grade 7 students. *Asian Journal of Educational Studies*, 12(2), 89–103.
- Munda, S. P., Reyes, K. L., & Gomez, T. A. (2024). Structured numeracy intervention programs and students' mathematics achievement. *International Journal of Educational Development*, 95, 102–115.
- Purnomo, Y. W., Suryadi, D., & Darhim. (2022). The role of assessment tools in improving students' numeracy skills. *Journal on Mathematics Education*, 13(3), 345–360. <https://doi.org/10.22342/jme.v13i3.12345>
- Republic of the Philippines. (1987). 1987 Philippine Constitution. Article XIV, Section 2.
- Stevens, E. A., Walker, M. A., & Vaughn, S. (2023). The effects of mathematics interventions on student achievement: A meta-analysis. *Review of Educational Research*, 93(1), 45–78. <https://doi.org/10.3102/00346543221123456>