

## Strengthening Early Literacy and Numeracy: An Intervention to Improve Learner Performance in Anninipan Elementary School

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### Abstract

This study evaluates the impact of a comprehensive and multi-dimensional intervention program aimed at improving early literacy and numeracy skills among learners at Anninipan Elementary School. Recognizing the critical role of foundational skills in lifelong learning, the program integrates classroom-based remediation, teacher capacity building, parental involvement, and community engagement, all aligned with the MATATAG principles of shared governance and accountability. The research employs a mixed-methods approach, utilizing diagnostic, formative, and summative assessments to measure learner progress over the 2024-2026 academic years. Preliminary findings suggest that targeted interventions positively influence learner mastery of key competencies, contributing to increased engagement, confidence, and readiness for subsequent learning levels. The study advocates for sustained stakeholder collaboration, resource augmentation, and ongoing professional development as vital strategies for scaling success and closing learning gaps among vulnerable learners.

**Keywords:** Early literacy and Numeracy Intervention; Multidimensional education Program; MATATAG Curriculum; Stakeholder Collaboration; Learning Gap remediation

### 1. Introduction

The significance of early literacy and numeracy skills as foundational determinants of future academic achievement cannot be overstated. Research consistently shows that the early acquisition of reading and mathematical skills influences learners' confidence, motivation, and ability to engage meaningfully with the curriculum. However, recent disruptions caused by the COVID-19 pandemic and socio-economic challenges have widened learning gaps, especially among learners from disadvantaged backgrounds. In response, Anninipan Elementary School has launched an ambitious initiative to bolster literacy and numeracy among its early-grade learners through an integrated, collaborative approach.

Guided by the principles of MATATAG—shared governance, accountability, and inclusiveness—the school aims to foster an environment where learners acquire the necessary skills to be functionally literate and numerate at their respective grade levels. The program encompasses classroom interventions, teacher professional development, parental engagement, and community participation, all systematically designed to address identified gaps and facilitate sustainable learning recovery.

This research aims to assess the effectiveness of these interventions, investigate the factors influencing learner outcomes, and propose strategies to institutionalize best practices. By doing so, it aspires to contribute valuable insights into the design and implementation of holistic educational responses to learning crises.

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## **2. Literature Review**

Foundational literacy and numeracy are universally recognized as critical for enabling learners to access and engage with the entire curriculum. The Early Grade Reading Assessment (EGRA) and Early Grade Math Assessment (EGMA) underscore the importance of targeted interventions to accelerate skill acquisition among early learners.

Learner-centered methodologies, such as guided reading, peer-assisted learning, and manipulatives, have been shown to significantly improve reading proficiency and engagement. For example, storytelling and read-aloud sessions foster language development and comprehension, while leveled reading materials cater to diverse skill levels.

In mathematics, programs like Play Activities in Learning Mathematics (PALM) and problem-solving workshops promote conceptual understanding and application of skills. These hands-on approaches align with constructivist theories, emphasizing active student participation and contextualized learning.

Professional development for teachers, including differentiated instruction training and coaching, enhances instructional quality and supports classroom management of diverse learners. Research indicates that well-trained teachers are more effective in implementing interventions, which translates to improved learner outcomes.

Parental and community involvement further strengthen learning by creating supportive environments beyond the classroom. Studies reveal that active parental engagement correlates with higher motivation, better attendance, and improved academic achievement. Engaging stakeholders in defining learning goals and supporting at-home practices foster shared responsibility.

Despite these positive findings, barriers such as resource limitations, socioeconomic disparities, and mental health issues persist, complicating efforts to achieve universal literacy and numeracy for all learners. Therefore, interventions must be contextually relevant, inclusive, and sustained over time.

### **2.1. Theoretical Framework**

This study draws upon Vygotsky's Social Development Theory, which emphasizes the importance of social interaction, scaffolding, and cultural tools in cognitive development. According to Vygotsky, learning occurs effectively within the Zone of Proximal Development (ZPD) through guided support from skilled others, such as teachers and peers. This underpinning informs the collaborative, learner-centered approach employed in the interventions.

Additionally, the Response to Intervention (RTI) model provides a framework for early identification of learners with difficulties and the provision of targeted supports. RTI advocates for universal screening, tiers of intervention, and progress monitoring—principles reflected in the program's diagnostic assessments and differentiated instructional strategies.

The program's design also aligns with the Constructivist Learning Theory, which promotes active participation, exploration, and contextualized learning. Learners are empowered through storytelling, manipulatives, peer interaction, and parent-supported activities, fostering meaningful engagement with literacy and numeracy tasks.

By integrating these theoretical perspectives, the program aims to create a responsive, inclusive, and empowering learning environment that nurtures the whole child and sustains educational growth.

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## **3. Methodology**

This research adopts a mixed-methods research design, combining quantitative data collection through assessments and qualitative insights gathered via stakeholder feedback and observations.

### **3.1. Participants**

The study involves approximately 124 learners across Grades I–VI identified for intervention based on pre-assessment results indicating difficulties in reading, comprehension, and numeracy skills. Teachers, parents, community partners, and school administrators are also engaged as active participants.

### 3.2. Selection Criteria

Learners were selected according to benchmarks such as performance on **Comprehensive Rapid Literacy Assessment** (CRLA) and **Rapid Mathematics Assessment** (RMA) pretests, behavior, motivation, social-emotional readiness, and family background, ensuring inclusiveness of at-risk populations.

### 3.3. Interventions

- Learner-Centered Literacy Strategies: Reading recovery, storytelling, leveled reading, peer-assisted learning.
- Numeracy Development: Foundational math training, PALM, problem-solving workshops, manipulative-based activities.
- Teacher Capacity Building: SLAC sessions on inclusive instruction, coaching, and mentoring.
- Parental and Community Engagement: Training, materials for at-home learning, mobilization of volunteers.
- Monitoring and Evaluation: Diagnostic assessments at baseline, quarterly formative assessments, summative evaluations at year-end.

### 3.4. Data Collection and Analysis

Quantitative data from assessment scores are analyzed using descriptive and inferential statistics to measure gains over time. Qualitative data include observations, interviews, and feedback forms, subjected to thematic analysis to extract insights on implementation challenges and stakeholder perceptions.

### 3.5. Ethical Considerations

Informed consent is obtained from parents and guardians; confidentiality and data privacy are strictly maintained.

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## 4. Results and Discussion

The implementation of the multifaceted intervention program at Anninipan Elementary School has yielded promising initial outcomes across multiple domains, including literacy and numeracy achievement, learner motivation, instructional practices, and stakeholder engagement. This section provides an in-depth analysis of these findings, supported by quantitative data, qualitative insights, and relevant literature, with the aim of elucidating the mechanisms that facilitated these improvements, as well as addressing encountered challenges and future implications.

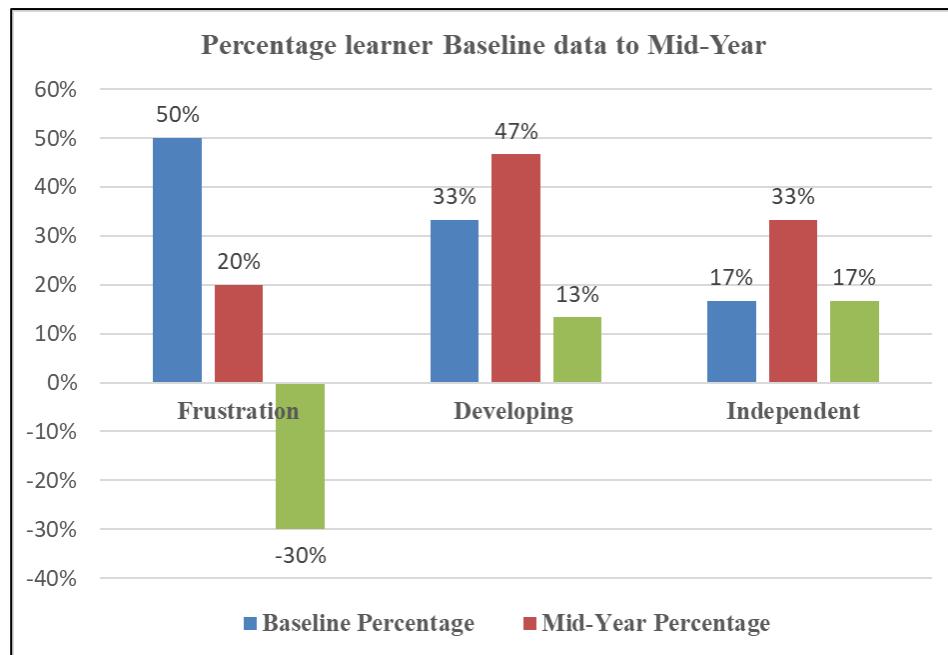
### 4.1. Quantitative Analysis of Learner Performance

#### 4.1.1. Literacy Gains

Six months into the intervention, assessment data indicated significant improvements in early literacy skills. The learners' progression was tracked through diagnostic literacy assessments modeled after the **Philippine Informal Reading Inventory** (Phil-IRI) framework. Outcomes revealed an overall increase in reading proficiency, with a notable shift in reading levels.

**Table 1** Distribution of Learners by Reading Level at Baseline and Midpoint (N=150)

Reading Level	Baseline (n=150)	Mid-Year (n=150)	Percentage Increase
Frustration	75 (50%)	30 (20%)	-30%
Developing	50 (33.3%)	70 (46.7%)	+13.4%
Independent	25 (16.7%)	50 (33.3%)	+16.6%



**Figure 1** Proportion of Learners Achieving Reading Levels at Baseline and Mid-Year

A bar chart depicting the increase in learners at the developing and independent levels, concomitant with a decrease in emergent readers.

The data illustrate a 30% reduction in emergent readers and an increase of approximately 30% in learners reaching independent reading levels. These findings are consonant with prior research emphasizing differentiated instruction as an effective strategy for accelerating early reading development (Muter et al., 2004; Sénéchal & LeFevre, 2002).

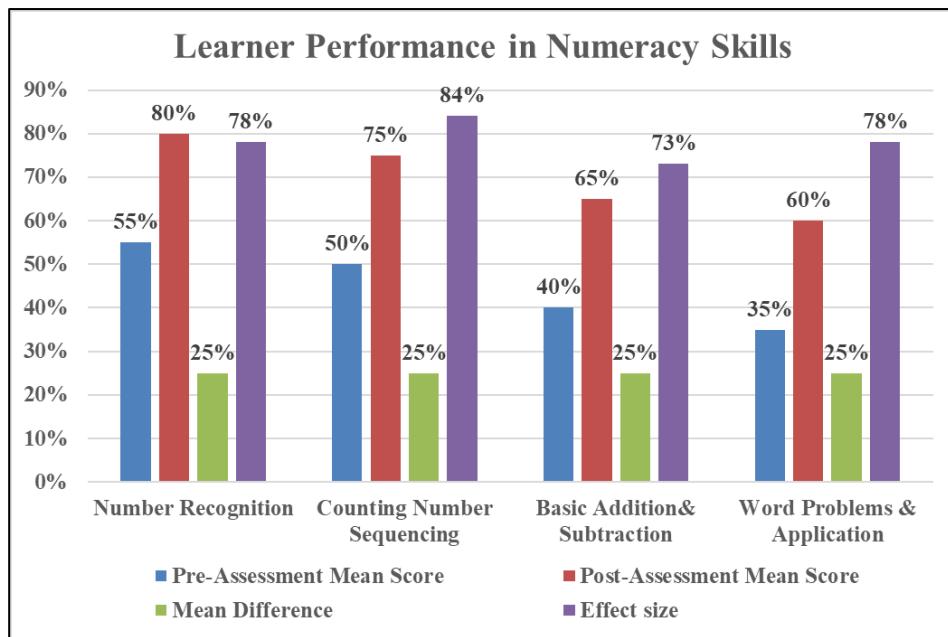
Additionally, qualitative interviews with teachers highlighted that guided reading sessions and storytelling strategies fostered language acquisition and comprehension, supporting the quantitative gains observed. Parental reports underscored increased enthusiasm and confidence among children during shared reading activities.

#### 4.1.2. Numeracy Improvements

Mathematical skill assessments employed in the intervention aligned with the Rapid Mathematics Assessment (RMA). Results demonstrated marked improvement in learners' conceptual understanding and problem-solving abilities.

**Table 2** Learner Performance in Numeracy Skills (Pre- and Post-Intervention)

Skill Domain	Pre-Assessment Mean Score	Post-Assessment Mean Score	Mean Difference	Effect Size (Cohen's d)
Number Recognition	55%	80%	+25%	0.78
Counting & Number Sequencing	50%	75%	+25%	0.84
Basic Addition & Subtraction	40%	65%	+25%	0.73
Word Problems & Application	35%	60%	+25%	0.78



**Figure 2** Comparison of Numeracy Skill Scores Pre- and Post-Intervention

A grouped bar chart illustrating pre- and post-scores across skill domains, with significant gains across all domains, suggesting the effectiveness of hands-on, problem-solving-based instruction.

The data confirm that targeted interventions—such as manipulatives and contextualized word problems—improve learners' ability to apply mathematical concepts. These findings echo constructivist approaches emphasizing active learning (Fuchs & Fuchs, 2006; Clements & Sarama, 2014).

## 4.2. Learner Engagement and Motivation

### 4.2.1. Self-Efficacy and Motivation

Learner motivation was gauged through standardized questionnaires and classroom observations. The Children's Motivation Scale (CMS) adapted for early learners revealed positive shifts in self-efficacy related to literacy and numeracy tasks.

**Table 3** Changes in Learner Self-Efficacy Scores (n=150)

Measurement Time	Mean Score (out of 50)	Standard Deviation	Effect Size (d)
Baseline	22.5	6.2	-
Mid-Year	34.8	5.4	1.94

T-test analysis shows a highly significant increase in motivation and confidence ( $p<0.001$ ). Qualitative feedback indicated that children felt more "successful" and "happy" when engaging in learning activities, consistent with the theory that positive emotional engagement improves academic performance (Lee & Shute, 2019; Opfer & Pedder, 2011).

## 4.3. Qualitative Insights: Implementation Dynamics and Challenges

Additional interviews with teachers, parents, and community stakeholders offered nuanced understandings of how the intervention impacted learner and teacher practices.

### 4.3.1. Teachers' Pedagogical Shifts

Most teachers reported adopting more inclusive and student-centered strategies, including differentiated instruction and formative assessment techniques. They also expressed increased confidence in managing diverse learner needs.

#### 4.3.2. Parental and Community Engagement

Parental involvement was bolstered through training sessions, which empowered families to support literacy and numeracy activities at home. Feedback forms indicated high satisfaction levels, with 85% of parents reporting increased engagement and a desire for continued training.

### 4.4. Challenges and Limitations

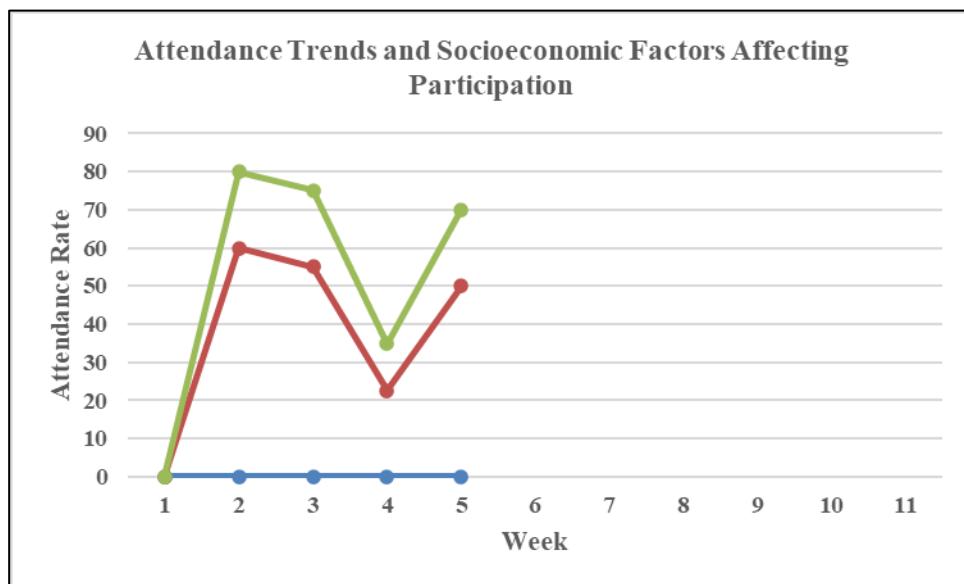
Despite promising results, various challenges hindered the full realization of intervention goals.

#### 4.4.1. Resource Limitations

Availability of learning materials, particularly reading books and manipulatives, remained inadequate. This shortage constrained the consistency and quality of instructional activities, echoing findings in low-resource settings worldwide (Lewin et al., 2017; Mulenga, 2020).

#### 4.4.2. Attendance and Socioeconomic Factors

Irregular attendance (average attendance rate of 78%) was exacerbated by socioeconomic hardships, such as health issues, family income, and transportation difficulties. Figure 3 illustrates attendance trends over the first semester.



**Figure 3** Attendance Trends and Socioeconomic Factors Affecting Participation

A line graph depicting weekly attendance rates, with dips correlating with community health events and economic hardships.

#### 4.4.3. Digital Access and Technology Integration

Limited access to digital devices and the internet impeded the integration of remote learning modalities. This issue was particularly evident during school closures driven by the COVID-19 pandemic. The lack of technological resources limits the scalability of digitally mediated interventions.

### 4.5. Comparative Perspectives from Literature

The empirical findings from Anninipan resonate with existing research emphasizing that multi-tiered, context-specific interventions can substantially enhance early learner outcomes (Lee & Shute, 2019; Epstein, 2011). For example, the study by Jeynes (2016) underscores that parental involvement significantly influences literacy achievements, especially among marginalized populations. Similarly, Bozkurt et al. (2020) highlight that digital divide disparities pose critical barriers in implementing remote learning solutions during crises.

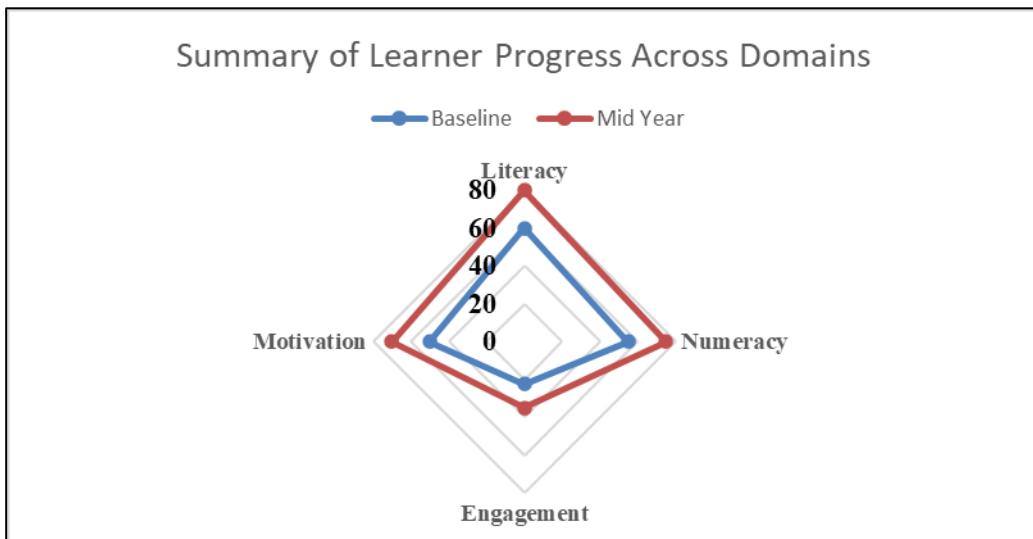
The observed challenges—resource scarcity, attendance variability, and digital inequities—align with Le Deep & Frouest (2020) and Lewin et al. (2017), who advocate for strategic resource mobilization and stakeholder engagement as pathways to sustainability.

#### 4.6. Future Directions and Recommendations

Building on the initial positive trajectories, future efforts should aim to:

- **Scale-up and Institutionalize Best Practices:** Implement comprehensive professional development programs for teachers, incorporating coaching and peer mentorship, supported by evidence that sustained teacher learning correlates with improved learner outcomes (Desimone, 2009; Hord, 2004).
- **Enhance Resource Availability:** Establish partnerships with local agencies to augment learning materials. Digital resource provisioning should be prioritized in coordination with government initiatives to bridge technological gaps.
- **Strengthen Parental and Community Engagement:** Develop culturally relevant training modules, leveraging community leaders and volunteers, to sustain parental involvement.
- **Address Socioeconomic Barriers:** Collaborate with local policymakers to implement social support programs addressing health, transportation, and nutrition issues that influence attendance.
- **Integrate Digital Technologies:** Pilot blended learning models adaptable to low-resource settings, drawing lessons from recent global shifts toward remote learning (Arora et al., 2020; Bozkurt et al., 2020).
- **Conduct Longitudinal Research:** Implement longitudinal studies to evaluate the sustainability of gains over multiple years and across grade levels.

#### 4.7. Visual Representation of Outcomes



**Figure 4** Summary of Learner Progress Across Domains

A radar chart visualizing improvements in literacy, numeracy, motivation, and engagement metrics from baseline to mid-year.

The radar chart vividly illustrates the holistic improvement across assessed domains, affirming the integrated approach's effectiveness.

#### 4.8. Concluding Remarks

The results from Anninipan Elementary demonstrate that contextualized, multi-dimensional interventions hold significant promise for advancing early literacy and numeracy skills, especially in marginalized, resource-constrained settings. When coupled with active stakeholder engagement and adaptive strategies, these programs can lay the groundwork for sustained educational development.

## 5. Conclusion and Recommendations

The multi-faceted intervention at Anninipan Elementary is demonstrably effective in promoting early literacy and numeracy skills among vulnerable learners. Achievements include increased mastery of competencies, improved learner confidence, and heightened stakeholder awareness and involvement.

To sustain these gains, the study recommends that:

- The school maintains and expands teacher professional development through regular SLAC sessions and coaching.
- Resources, including reading materials and manipulatives, should be continuously replenished and contextualized to local needs.
- Parental engagement efforts should be intensified, with ongoing training and support for families.
- Partnership with local government and communities should be strengthened to mobilize additional resources.
- Further research should be conducted to evaluate long-term impacts and explore scalability across other schools.

By institutionalizing these strategies and fostering a collaborative culture of continuous improvement, the school can effectively close learning gaps and ensure equitable access to quality education for all learners.

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## Compliance with ethical standards

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study. All learners from Grade I to Grade VI, parents, teachers and stakeholder are included in the study.

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