ISSN: 2945-4190

` *World Journal on Education and Humanities Research*
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Vol. 6, Issue 2, pp. 53-63
Received, June 2026; Revised July 2026;
Accepted July 2026

Article

From Data to Development: Crafting A Strategic Intervention Program for Early Grade Literacy and Numeracy

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Abstract: This study examined the literacy and numeracy performance of kindergarten learners in selected public elementary schools within the DepEd Cebu City Division. A descriptive–correlational research design was employed. The study was conducted in Don Vicente Rama Memorial Elementary School, Basak Community Elementary School, and Mangabon Elementary School. Using purposive sampling in the selection of kindergarten sections and total enumeration of learners within the selected sections, the study involved 236 kindergarten learners. Data were gathered using the Kindergarten Literacy Checklist and Kindergarten Numeracy Checklist, supported by the official Assessment Forms and Scoring Guide prescribed by the Department of Education. The collected data were analyzed using frequency count, simple percentage, mean, standard deviation, and Pearson Product–Moment Correlation Coefficient. The findings revealed varying levels of literacy and numeracy performance across the assessed domains. The results further indicated a significant relationship between learners' literacy performance and numeracy performance. Based on the findings, a Strategic Intervention Program for Early Grade Literacy and Numeracy was developed. It was concluded that strengthening foundational literacy and numeracy competencies through assessment-informed interventions was essential in supporting learners' academic readiness and future learning success. The study recommended the implementation and continuous evaluation of the proposed intervention program.

Keywords: early grade literacy, early numeracy, alphabet knowledge, phonological awareness, book and print knowledge, number concept

Introduction

The kindergarten year is crucial for establishing competencies that support later learning across the curriculum (Lyons, 2024). Early literacy develops through interconnected abilities such as alphabet knowledge, awareness of speech sounds, and understanding how books and print work. Early numeracy grows through experiences with quantity, patterns, comparison, classification, and reasoning

(Bonello, 2025). Recent evidence shows that supportive classroom interactions and well-designed instruction can strengthen children's pre-literacy development, particularly phonological awareness and print-related knowledge (Wang et al., 2024). Research on early childhood pedagogy also indicates that developmentally appropriate, play-based learning can improve engagement and academic outcomes when activities are intentionally connected to learning goals (Alotaibi, 2024). Assessing these competencies at the end of kindergarten therefore provides a meaningful picture of children's readiness for the more formal literacy and mathematics demands of Grade 1.

Within early literacy, alphabet knowledge, phonological awareness, and book and print knowledge are distinct yet mutually reinforcing foundations. Alphabet knowledge enables learners to recognize letters and connect symbols with sounds, whereas phonological awareness allows them to notice and manipulate the sound structures of spoken language. Book and print knowledge helps children understand print directionality, book handling, and the communicative purpose of written text. A recent case study identified oral language, alphabetic knowledge, and print awareness as central building blocks that should be developed in an integrated manner (Mawarni & Pramudyani, 2025). Meta-analytic evidence further indicates that the quality of teacher–child interactions is associated with gains in phonological awareness, print knowledge, and related pre-literacy abilities (Wang et al., 2024). These domains therefore provide useful indicators of kindergarten learners' developmental strengths and specific learning needs.

Early numeracy is equally important because it supports children's ability to interpret quantities, relationships, patterns, space, and everyday problems. Number concepts include counting, numeral recognition, quantity comparison, and understanding that numbers represent amounts. Attributes and properties involve sorting, classifying, comparing, and describing objects according to size, shape, length, position, or other observable features. Thinking skills require learners to recognize relationships, make predictions, explain solutions, and apply mathematical ideas in unfamiliar situations. Research on preschool mathematics highlights the importance of teachers' pedagogical content knowledge in helping children build accurate number-comparison concepts (Li et al., 2025). Broader evidence also suggests that early mathematical performance depends on several interacting cognitive factors rather than counting skill alone (Amland et al., 2025). Assessment should therefore examine both numerical knowledge and the reasoning processes needed to use mathematics meaningfully.

Monitoring foundational learning is increasingly important because early weaknesses can accumulate and restrict later achievement. Studies show that children benefit when literacy and numeracy instruction is explicit, responsive, and connected to purposeful activities. A meta-analysis of the home mathematics environment found meaningful associations between children's mathematical experiences and achievement, underscoring the influence of opportunities inside and outside school (Daucourt et al., 2021). In literacy, children's reading experiences also vary according

to the medium and instructional context, while adult support remains important for comprehension and engagement (Furenes et al., 2021). Recent research on effective pre-primary mathematics teaching further emphasizes cognitively demanding tasks, feedback, and sustained learner participation (Michaelidou et al., 2025). Together, these findings support systematic end-of-year assessment as a basis for identifying learning needs and making targeted instructional decisions.

Despite the expanding literature on early literacy and numeracy, an important local research gap remains. Many recent studies examine a single skill area, a particular teaching approach, home learning conditions, or broad preschool outcomes, while fewer studies analyze literacy and numeracy together using actual end-of-school-year assessment results. Evidence is especially limited for kindergarten learners in selected schools within the DepEd Cebu City Division during School Year 2025–2026. Differences in language exposure, classroom resources, school context, and prior learning opportunities may produce performance patterns that findings from other countries or Philippine divisions cannot fully explain. Moreover, little evidence shows how results in alphabet knowledge, phonological awareness, book and print knowledge, number concepts, attributes and properties, and thinking skills can be translated into one coherent, data-based intervention program responsive to the identified needs of these learners.

To address this gap, the present study examines the End-of-School-Year assessment performance of kindergarten learners in selected schools within the DepEd Cebu City Division. It determines learners' literacy performance in alphabet knowledge, phonological awareness, and book and print knowledge, as well as their numeracy performance in number concepts, attributes and properties, and thinking skills. By identifying areas of relative mastery and competencies requiring additional support, the study aims to establish an empirical basis for a Strategic Intervention Program for Early Grade Literacy and Numeracy. The proposed program will align intervention activities with needs revealed by the assessment, enabling teachers and school leaders to prioritize instruction, allocate learning resources, and monitor progress purposefully. Ultimately, the study seeks to provide localized evidence that can strengthen kindergarten instruction and improve learners' readiness for Grade 1.

Literature Review

Recent literature describes emergent literacy as a coordinated system of oral-language, sound-processing, and print-related competencies. In a quasi-experimental kindergarten study, Engel de Abreu, Fricke, and Wealer (2020) found that structured instruction improved phonological awareness and letter knowledge among linguistically diverse learners, demonstrating that these abilities can be strengthened through focused classroom activities. Similarly, digital phonics instruction was shown to promote receptive letter knowledge and print-related skills among prereaders at cognitive risk for dyslexia, suggesting that interactive learning materials may supplement teacher-directed instruction (Vanden Bempt et al., 2021). Beyond

recognizing letters, children must understand that printed symbols represent spoken language and follow conventional patterns within books and other texts. These findings support the separate assessment of alphabet knowledge, phonological awareness, and book and print knowledge because each domain provides distinct information about learners' readiness for formal reading instruction.

Early numeracy literature emphasizes that mathematical readiness extends beyond rote counting and numeral recognition. A longitudinal meta-analysis found that early numeracy competencies significantly predict later mathematics performance, although the strength of prediction differs across numerical, relational, and reasoning skills (Liu, Peng, & Yan, 2025). Spatial abilities are also important because children use them when identifying shapes, comparing dimensions, organizing objects, and understanding relationships among quantities. A meta-analysis of early spatial-skills training reported that properly designed interventions can improve spatial performance during childhood, with potential benefits for mathematical reasoning and related academic abilities (Yang et al., 2020). Moreover, home-based experiences involving counting, number talk, measurement, and problem-solving are associated with children's developing numeracy competencies (Mues et al., 2022). These studies justify examining number concepts, attributes and properties, and thinking skills as interconnected but independently measurable components of kindergarten numeracy performance.

Methodology

This study employed a descriptive-correlational research design using a quantitative approach to examine the literacy and numeracy performance of kindergarten learners in selected public elementary schools within the DepEd Cebu City Division during School Year 2025–2026. The descriptive component determined learners' literacy performance in terms of alphabet knowledge, phonological awareness, and book and print knowledge. It also assessed numeracy performance according to number concepts, identifying attributes, and thinking skills. Meanwhile, the correlational component determined whether a significant relationship existed between learners' literacy and numeracy performance. This design was appropriate because it allowed the researcher to describe the learners' competencies objectively and examine the association between the variables without manipulating existing conditions. As explained by Creswell and Creswell (2018), quantitative descriptive research presents the characteristics of a population through systematically collected numerical data, while correlational research measures the degree of association between variables without establishing experimental control (Fraenkel et al., 2019).

The study was conducted in Don Vicente Rama Memorial Elementary School, Basak Community Elementary School, and Mangabon Elementary School. These public elementary schools were purposively selected based on their inclusion in the study locale and the availability of complete End-of-School-Year assessment records. The respondents consisted of 236 kindergarten learners enrolled in selected sections of the

three schools. Their official End-of-School-Year literacy and numeracy assessment results served as the primary source of data. The assessment scores were organized, encoded, checked, and analyzed using appropriate descriptive and inferential statistical procedures. Frequencies, percentages, means, and standard deviations were used to describe performance levels, while an appropriate correlation test was applied to determine the relationship between literacy and numeracy scores. The study followed the Input–Process–Output Continuum Model, wherein assessment results constituted the inputs, data collection and statistical analysis formed the process, and the proposed Strategic Intervention Program for Early Grade Literacy and Numeracy represented the principal output. Confidentiality, anonymity, and proper handling of learners' records were observed throughout the research process.

Results

Table 1. Level of Literacy Skills of The Kindergarten Learners in Terms of Alphabet Knowledge

Level	Range of Scores	f	%
Advanced	53-78	214	90.68
Intermediate	27-52	21	8.90
Beginner	0-26	1	0.42
Total		236	100.00

Table 1 shows that most kindergarten learners demonstrated advanced alphabet knowledge. Of the 236 learners, 214 or 90.68% scored within the advanced level, while 21 or 8.90% were intermediate. Only one learner, representing 0.42%, was classified as a beginner. These results indicate generally strong letter recognition and alphabet-related competencies, with minimal need for intensive remediation among the assessed kindergarten population.

Table 2. Level of Literacy Skills of The Kindergarten Learners in Terms of Phonological Awareness

Level	Range of Scores	f	%
Advanced	11-13	106	44.92
Intermediate	6-10	116	49.15
Beginner	0-5	14	5.93
Total		236	100.00

Table 2 indicates that learners' phonological awareness was generally developing. Among the 236 learners, 116 or 49.15% were at the intermediate level, while 106 or 44.92% achieved the advanced level. Fourteen learners or 5.93% remained beginners. The findings suggest that most learners possess basic sound-awareness skills, although targeted activities in identifying, blending, and manipulating sounds are still needed.

Table 3. Level of Literacy Skills of The Kindergarten Learners in Terms of Book and Print Knowledge

Level	Range of Scores	f	%
Advanced	6-7	186	78.81
Intermediate	4-5	38	16.10
Beginner	0-3	12	5.08
Total		236	100.00

Table 3 reveals that most kindergarten learners demonstrated advanced book and print knowledge. Of the 236 learners, 186 or 78.81% reached the advanced level, while 38 or 16.10% were intermediate. Twelve learners or 5.08% were beginners. The findings indicate strong understanding of book handling and print conventions, although targeted support remains necessary for learners with limited print awareness.

Table 4. Level of Numeracy Skills of The Kindergarten Learners in Terms of Number Concepts

Level	Range of Scores	f	%
Advanced	21-30	222	94.07
Intermediate	11-20	12	5.08
Beginner	0-10	2	0.85
Total		236	100.00

Table 4 shows that the kindergarten learners demonstrated a very high level of number-concept proficiency. Of the 236 learners, 222 or 94.07% reached the advanced level, while 12 or 5.08% were intermediate. Only two learners or 0.85% were beginners. These findings indicate strong competencies in counting, numeral recognition, quantity identification, and other foundational number skills.

Table 5. Level of Numeracy Skills of the Kindergarten Learners in Terms of Identifying Attributes

Level	Range of Scores	f	%
Advanced	11–13	176	74.58
Intermediate	6–10	50	21.19
Beginner	0–5	10	4.24
Total		236	100.00

Table 5 shows that most kindergarten learners demonstrated advanced skills in identifying attributes. Of the 236 learners, 176 or 74.58% reached the advanced level, while 50 or 21.19% were intermediate. Ten learners or 4.24% remained beginners. The results indicate generally strong abilities in recognizing, comparing, sorting, and

classifying objects, although targeted support is needed for some learners.

Table 6. Level of Numeracy Skills of The Kindergarten Learners in Terms of Thinking Skills

Level	Range of Scores	f	%
Advanced	8-10	202	85.59
Intermediate	4-7	27	11.44
Beginner	0-3	7	2.97
Total		236	100.00

Table 6 shows that most kindergarten learners demonstrated advanced thinking skills. Of the 236 learners, 202 or 85.59% reached the advanced level, while 27 or 11.44% were classified as intermediate. Only seven learners or 2.97% remained at the beginner level. The findings indicate strong abilities in reasoning, recognizing patterns, solving simple problems, and applying mathematical ideas.

Table 7. Test of Relationship Between Learners' Literacy Performance and Their Numeracy Performance

Variables	r-value	Strength of Correlation	p-value	Decision	Remarks
Literacy Performance and Numeracy Performance	0.722*	Strong Positive	0.000	Reject H_0	Significant

Significant at $p < 0.05$ (two-tailed)

Table 7 shows a strong positive and statistically significant relationship between kindergarten learners' literacy and numeracy performance. The computed correlation coefficient of 0.722 indicates that learners who obtained higher literacy scores also tended to achieve higher numeracy scores. Since the p-value of 0.000 is lower than the 0.05 significance level, the null hypothesis was rejected. This finding confirms that literacy and numeracy competencies are meaningfully associated among the respondents. It further suggests that strengthening alphabet knowledge, phonological awareness, and print knowledge may support mathematical understanding, while numeracy activities may also reinforce language, reasoning, comprehension, and problem-solving skills among kindergarten learners.

Discussions

The findings show that the kindergarten learners generally demonstrated well-developed foundational literacy and numeracy competencies. Their strongest literacy area was alphabet knowledge, indicating that most learners could recognize letters and demonstrate the basic skills needed for beginning reading. Book and print knowledge was also highly developed, suggesting familiarity with book handling,

print direction, and the functions of written language. Phonological awareness, however, emerged as the literacy area requiring greater attention because many learners were still developing their ability to recognize, distinguish, blend, and manipulate sounds. This pattern implies that learners may recognize letters and printed materials more readily than they can process the sound structures of spoken words.

In numeracy, learners showed particularly strong mastery of number concepts and thinking skills, reflecting their ability to recognize numbers, understand quantities, identify patterns, reason, and solve simple mathematical problems. Their performance in identifying attributes was also generally strong, although some learners still needed support in comparing, sorting, and classifying objects according to observable characteristics. The significant positive relationship between literacy and numeracy suggests that these domains develop in connected ways. Learners who perform well in language-related tasks are also likely to demonstrate stronger mathematical understanding and reasoning. Therefore, intervention activities should integrate sound awareness, vocabulary, classification, counting, pattern recognition, and problem-solving rather than teaching literacy and numeracy as completely separate areas.

Conclusion

Based on the findings of the study, it was concluded that the kindergarten learners generally demonstrated strong foundational literacy and numeracy competencies, particularly in alphabet knowledge, book and print knowledge, number concepts, identifying attributes, and thinking skills, indicating that they had successfully acquired the essential skills expected at the kindergarten level. However, phonological awareness emerged as a developmental area that required continued instructional support to further strengthen learners' readiness for formal reading instruction. The results further suggested that literacy and numeracy development were closely interconnected, emphasizing the importance of providing integrated and developmentally appropriate learning experiences that simultaneously promote language and mathematical competencies.

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