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# Assessing the Numeracy Performance of Kindergarten Learners Exposed to Number Sense Activities

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**Abstract:**

This research assesses the implementation of number sense activities and the numeracy performance of kindergarten learners at Tabok Elementary School 1 in Mandaue City for the school year 2025–2026, as a basis for a proposed Numeracy Skills Enhancement Plan. The study used a descriptive-correlational research design and utilized a teacher survey questionnaire and an adapted numeracy performance test. The data were analyzed using frequency percentages, weighted means, Pearson Product-Moment Correlation (r), and multiple linear regression. Findings revealed that number sense activities such as number recognition, counting skills, and basic operations were highly implemented, while number comparison was less consistently emphasized. Learners demonstrated satisfactory performance across most numeracy domains; however, difficulties were observed, particularly in number-comparison skills. Statistical analysis showed a significant relationship between implementing number sense activities and learners' numeracy performance, indicating that effective instructional practices contribute to improved mathematical skills. The study highlights the need for teachers to strengthen targeted number-sense activities, particularly number comparison, and to use more structured, hands-on, and engaging strategies in early mathematics instruction. It further emphasizes the importance of consistent implementation and monitoring of numeracy activities. Future research may explore additional variables such as instructional strategies, learning environments, and learner engagement to enhance early numeracy development.

**Keywords:** early childhood education, number sense activities, numeracy performance, descriptive-correlational research, Mandaue City, Cebu, Philippines.

# CHAPTER 1
# THE PROBLEM AND ITS RESEARCH DESIGN
## INTRODUCTION
### Rationale

Early childhood education is crucial for fostering children's cognitive, social, and academic development. During this period, learners begin to build foundational skills that influence their later school performance, particularly in literacy and numeracy. Duncan et al. emphasized that early math skills play a crucial role as predictors of future academic achievement. Jordan et al. emphasized that early number sense is crucial for children's future success in mathematics. Consequently, developing numeracy skills in kindergarten is essential, as it promotes logical thinking and problem-solving and prepares students for more complex mathematical tasks.

At the center of early numeracy development is number sense. Number sense refers to a child's comprehension of numbers, quantities, their relationships, and fundamental operations. It goes beyond memorizing number names or counting in sequence, involving recognizing numerical symbols, understanding "how many," comparing quantities, and performing simple addition and subtraction. Piaget's Cognitive Development Theory states that young children grasp concepts most effectively through tangible, hands-on activities that match their developmental level. Vygotsky's Socio-Cultural Theory further supports this by emphasizing the importance of teacher guidance, scaffolding, and social interaction in learning. Bruner's Constructivist Theory suggests that children grasp concepts better as they progress, transforming concrete experiences into visual representations and, finally, into symbolic understanding.

In kindergarten classrooms, number sense activities offer valuable opportunities for students to link abstract math concepts with tangible experiences. These activities might involve counting games, number recognition exercises, manipulatives, visual aids, guided play, and simple problem-solving tasks. Almulhim and Fujita [1] stressed that children learn mathematical concepts more effectively when they are actively engaged in experiences that allow them to construct meaning. Similarly, Byrne [2] found that physical manipulatives improve children's retention and understanding, while DePascale and Ramani [3] emphasized the importance of game-based learning in fostering early mathematical skills. These findings suggest that number-sense activities are useful not only for teaching numbers but also for developing a deeper mathematical understanding.

However, despite the regular use of number sense activities in kindergarten classrooms, differences in learners' numeracy performance remain evident. Some learners can recognize numbers, count accurately, compare quantities, and perform simple operations with ease, while others continue to struggle in these areas. Sabasaje and Oco [4] highlighted that structured number-sense activities play a crucial role in developing numeracy skills among young students. This indicates that the concern extends beyond merely having number sense activities in the classroom, focusing also on the consistency and quality of their implementation.

In the Philippine context, early numeracy remains crucial because students start kindergarten with diverse home environments, learning experiences, and readiness levels. Onoshakpokaiye [5] highlighted that targeted instructional support is essential to help children develop their informal mathematical knowledge into formal numeracy skills. Approaches that are local and context-specific are also vital, especially in schools where learners have limited access to learning materials outside of class. Researchers such as De Chambrier [6], Tayaban [7], and Adawurah [8] emphasize that contextualized, play-based numeracy activities can effectively address early math gaps, especially when teachers tailor strategies to learners' needs and environments.

At Tabok Elementary School 1 in Mandaue City, kindergarten students participated in number-sense activities, but differences in their numeracy skills persist. Some students still find it challenging to recognize numbers, count, compare numbers, and perform basic operations. This highlights the

importance of evaluating how well these activities are implemented and their impact on students' numeracy development. The study's results provide evidence-based insights into which aspects of number sense require improvement and form the foundation for a proposed Numeracy Skills Enhancement Plan for kindergarten learners.

## Theoretical Background

The conceptualization of this study rests on a dual foundation of developmental psychology and national educational mandates. The Theoretical Background draws on cognitive-developmental and constructivist paradigms to explain how kindergarten learners internalize numerical concepts through active engagement and social mediation. This study was anchored in Piaget's Cognitive Development Theory (1952), Vygotsky's Socio-Cultural Theory (1934, 1978), and Bruner's Constructivist Theory (1966), as well as legal mandates, including Republic Act No. 10157 [9], Republic Act No. 10533 [10], and DepEd Order No. 47, s. [11]. Complementing these were the Legal Bases, which provided the policy framework and statutory justification for prioritizing early numeracy within the Philippine K-12 system. Together, these foundations ensure that the proposed Numeracy Skills Enhancement Plan is both pedagogically sound and aligned with national standards for early childhood excellence.

The growth of number sense in kindergarten students was closely based on established theories of cognitive and early childhood development. These theories illuminated how young children develop foundational mathematical understanding and how specific instructional strategies can effectively support this process. Number sense activities, including counting exercises, guided play, manipulatives, visual aids, and hands-on mathematical tasks, are grounded in decades of research indicating that children learn most effectively through active engagement in meaning-making.

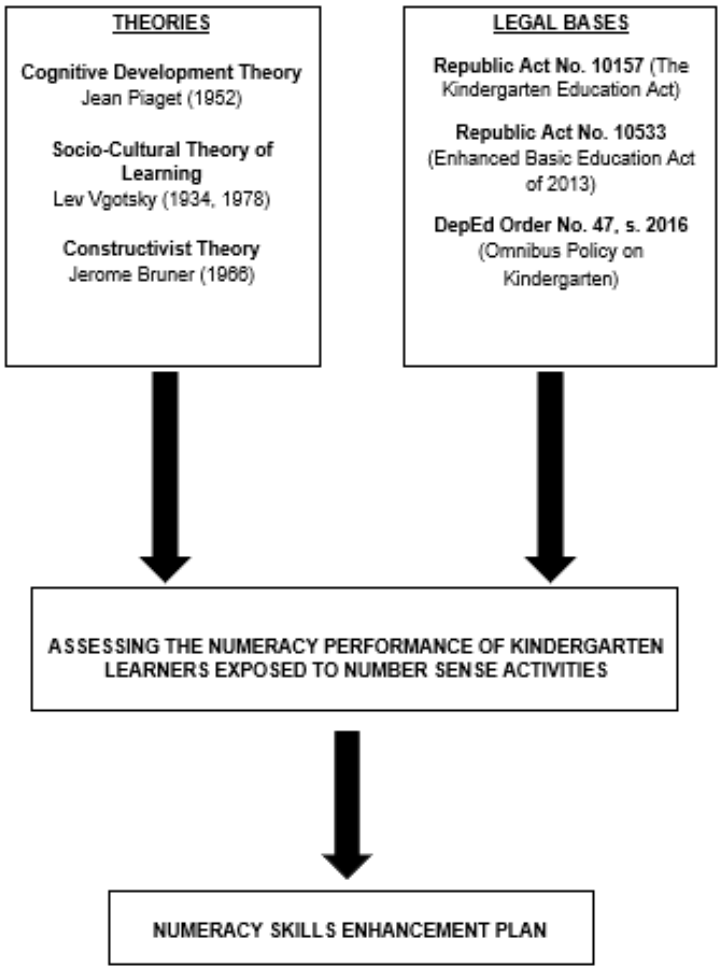


**Figure 1. Theoretical Framework of the Study**

These activities were designed not only to teach numbers but also to build an intuitive grasp of quantities, relationships, and early operations. Examining these theoretical foundations enhances educators' and researchers' capacity to design learning experiences tailored to young children's cognitive development. Anchoring the study in these theoretical frameworks ensures that the intervention is developmentally appropriate, pedagogically sound, and supported by empirical evidence. The main theories informing the rationale and execution of number sense activities in this study are Piaget's Cognitive Development Theory, Vygotsky's Sociocultural Theory, and Bruner's Constructivist Theory.

Piaget's Cognitive Development Theory provides the primary framework for understanding a child's readiness to engage with numbers. The study is grounded in the principle that kindergarteners are in the preoperational stage, where learning must be rooted in physical reality. Supporting concepts such as Conservation of Number and One-to-One Correspondence define the specific cognitive milestones the study aims to achieve, ensuring learners understand that quantity remains constant regardless of arrangement. Through Classification and Seriation, the "Number Sense Activities" help children organize their environment, while Reversibility and Hierarchical Inclusion help them grasp the internal logic of addition and subtraction. By addressing Centration and Egocentrism, the study facilitates the child's transition from intuitive guessing to logical reasoning. Ultimately, the processes of Assimilation, Accommodation, and Equilibration explain the internal mental restructuring that occurs when a child interacts with the intervention, transforming physical play into lasting Logico-Mathematical Knowledge.

Vygotsky's Socio-Cultural Theory provides the pedagogical strategy for the study, asserting that numeracy is a socially mediated achievement. This theory connects to the intervention by framing the teacher as a More Knowledgeable Guide. Other (MKO) who guides the learner through their Zone of Proximal Development (ZPD). The "Influence of Number Sense Activities" is maximized through Scaffolding and Mediation, in which instructional cues and cultural tools, such as counters or number charts, connect tangible objects with abstract ideas. Supporting elements like Private Speech and Internalization describe the process by which children turn social "Math Talk" into independent mental calculation. By fostering Intersubjectivity and Collaborative Learning, the study leverages the classroom's Social Context, ensuring that numeracy performance is not just an individual effort but a result of meaningful interaction and the internalization of shared mathematical signs.

Bruner's Constructivist Theory establishes the instructional sequence for the Numeracy Skills Enhancement Plan. The study adopts Bruner's C-P-A (Concrete-Pictorial-Abstract) model, ensuring that learners progress from Enactive Representation (hands-on) to Iconic Representation (visuals) before reaching the Symbolic stage of written numerals. This is supported by a Spiral Curriculum approach, in which numerical concepts are revisited with increasing complexity to ensure deep mastery. Concepts of Discovery Learning and Intuitive Thinking are integrated to allow children to "find" mathematical patterns, making lessons more memorable. By focusing on the Structure of Knowledge and Categorization, the study helps children file information logically rather than by rote. This framework ensures that Readiness is respected and that Intrinsic Motivation is sparked, as the activities are designed to make the discovery of math inherently rewarding for the young learner.

Piaget's theory supports the need for preoperational learners to learn from physical reality. Vygotsky's framework emphasizes that numeracy is a socially mediated achievement requiring a "More Knowledgeable Other". Bruner's C-P-A model establishes the instructional sequence from concrete to symbolic.

The Legal Foundations of Early Numeracy includes Republic Act No. 10157 (The Kindergarten Education Act), which provides the statutory mandate institutionalizing early numeracy as a right for every Filipino child. This law connects to the study by requiring a "standardized and developmentally appropriate" curriculum, which the Numeracy Skills Enhancement Plan seeks to support. Supporting

policies such as Universal Access and the Mandatory Entry Age define the target population, while the Mother Tongue-Based Multilingual Education (MTB-MLE) and the School Readiness Assessment (SReA) ensure that the numeracy intervention is culturally and linguistically sensitive. The law's Play-Based Mandate and Inclusive Education policy provide the legal basis for using manipulatives and games to reach all types of learners. By aligning with Teacher Qualification standards and Global Competitiveness goals, the study ensures that its activities contribute to the national objective of preparing children for the academic rigors of higher grades.

Republic Act No. 10533 (Enhanced Basic Education Act of 2013), or the K-12 Law, provides structural continuity for the study's outcomes through the Spiral Progression of the mathematics curriculum. It highlights that the fundamental number sense gained in kindergarten is crucial for succeeding in more advanced mathematics later. Policies of Contextualization and Localization empower the researcher to use community-relevant materials, ensuring that activities are meaningful to the learner's daily life. The law's emphasis on Learner-Centeredness and 21st-century skills shifts the study's focus from rote counting to critical problem-solving. Through Assessment Reform and the Professional Standards (PPST), the Act mandates that interventions be data-driven and research-based. Ultimately, the goal of Holistic Development is to ensure that improving "Numeracy Performance" is seen as a vital part of developing the child's total cognitive and social potential.

DepEd Order No. 47, s. (Omnibus Policy on Kindergarten) serves as the operational blueprint for the environment in which this study takes place. It connects to the research by mandating specific Blocks of Time and Work Periods during which numeracy activities must be prioritized. Supporting mandates for a Mathematics Corner and the provision of Manipulative Materials ensure that the physical classroom is legally equipped for the study's intervention. The Developmental Checklist serves as the official instrument for measuring the numeracy gains targeted by the enhancement plan. Policies on Teacher-Child Ratio and Parental Engagement provide the human support system necessary for scaffolding. Finally, the Transition Program and Health/Nutrition Protocols acknowledge that a child's numerical performance is part of a wider ecosystem of care, ensuring that the enhancement plan prepares them for a successful transition into the primary years.

Beyond these major theorists, contemporary research in early childhood mathematics further strengthens the rationale for using number sense activities in kindergarten classrooms. Modern developmental science underscores the importance of early exposure to mathematical concepts, showing that children develop informal mathematical knowledge long before they enter school. By grounding the study in these combined theoretical and empirical insights, educators gain a comprehensive framework for understanding how and why targeted number sense activities can effectively support kindergarten learners' early numeracy development.

## THE PROBLEM

### Statement of the Problem

This study aimed to assess the numeracy performance of kindergarten learners exposed to number sense activities at Tabok Elementary School 1, Mandaue City Division, during S.Y. 2025-2026, as a basis for a numeracy skills enhancement plan.

Specifically, this study aimed to answer the following questions:

1. What is the profile of the respondent groups in terms of:

1.1 Learners,

1.1.1 age and gender,

1.1.2 parents' highest educational attainment,

1.1.3 number of siblings, and

1.1.4 combined family monthly income?

1.2 Teachers,

1.2.1 age and gender,

1.2.2 highest educational attainment, and

1.2.3 number of years of teaching?

2. What is the level of implementation of number sense activities as reported by the kindergarten teachers in terms of:

1. number recognition,
2. counting skills,
3. number comparison, and
4. basic operations?

3. What is the level of numeracy performance of kindergarten learners in terms of:

3.1 number recognition,

3.2 counting skills,

3.3 number comparison, and

3.4 basic operations?

4. Is there a significant relationship between the learners' profile and their numeracy performance?

5. Based on the findings, what numeracy skills enhancement plan can be proposed?

**Statement of the Null Hypotheses**

This research's framework focused on exploring how instructional interventions relate to student outcomes. As a result, the study was guided by specific hypotheses that underpin the statistical analysis and data interpretation.

$H_0$: There was no significant influence of number sense activities on the numeracy performance of kindergarten learners.

**Significance of the Study**

This research offers empirical evidence to guide policymaking and help curriculum designers adopt effective teaching approaches. Most notably, kindergarten students at Tabok Elementary School 1 will benefit from improved pedagogical strategies, and teachers will be better equipped to customize instruction to meet the needs of diverse learners .

DepEd officials will be able to use the findings to develop and implement policies that strengthen numeracy education across schools, such as funding for mathematics resource hubs and teacher training programs.

Curriculum designers will benefit from a detailed analysis of how to integrate a range of number-sense activities and teaching methods into the curriculum to enhance numeracy development.

Kindergarten learners will be the primary beneficiaries of the study. The proposed enhancement of numeracy activities and pedagogical strategies will help improve their mathematical proficiency, comprehension, and overall academic performance. The study will also seek to make learning more engaging and accessible, thereby supporting learners' mathematical development.

School administrators will also benefit from this research. The findings will inform curriculum development, instructional planning, and resource allocation, enabling administrators to make evidence-based decisions that prioritize effective numeracy education.

Teachers will gain valuable insights into effective number-sense activities and teaching methods. With a deeper understanding of how strategies and resources may influence student learning, teachers can tailor their approaches to meet the diverse needs of their students, fostering a more inclusive and effective learning environment.

The study will also benefit parents and guardians by highlighting their role in supporting their children's numeracy development at home. The study's insights will help them better understand how to strengthen learning outside the classroom.

The researcher will benefit from conducting this study by providing an opportunity to contribute to educational practices and policies. It will also allow the researcher to bridge theoretical knowledge and practical application, leading to a deeper understanding of the factors that enhance numeracy education.

Future researchers will benefit from this study, which will contribute to the academic discourse on numeracy education. It will also help fill gaps in the existing literature and offer new perspectives on number sense activities, teaching strategies, and early numeracy development.

## RESEARCH METHODOLOGY

This study carefully outlines its research methodology, covering the research design, study setting, participant criteria, and reasons for choosing specific instruments. The subsequent sections elucidate the procedures for data collection and analysis, thereby ensuring the study's rigor and transparency and establishing a clear framework to facilitate future replication in the exploration of number-sense implementation and the development of early numeracy skills.

### Design

This study employed a descriptive-correlational research design. The descriptive section detailed the profiles of the respondent groups, the extent of number-sense activities implemented, and the numeracy performance of kindergarten learners. The correlational section examined whether there was a significant link between the learners' profiles and their numeracy performance.

The variables examined for potential relationships included learners' profiles and numeracy capabilities. The profiles of the learners included age, gender, their parents' highest education level, the number of siblings, and the families' total monthly income. Numeracy performance was assessed through measures like recognizing numbers, counting abilities, comparing numbers, and fundamental arithmetic operations. The study aimed to ascertain whether these profile variables were significantly correlated with the learners' numeracy performance.

The study employed an appropriate design because the researcher did not alter any variables or introduce an experimental treatment. Instead, the study described the existing conditions at Tabok Elementary School 1 and examined the relationships among the identified variables using data gathered from the respondents. Since the study focused on describing levels and testing associations, the descriptive-correlational design was appropriate for addressing the problems outlined.

The collected data were examined for completeness, systematically coded, tabulated, and subsequently entered into a master data sheet. After completing data-cleaning, responses were examined using frequency counts, percentages, weighted means, standard deviations, and a Chi-square test. The results were organized into tables related to the research problem and interpreted to form the basis for the proposed Numeracy Skills Enhancement Plan.

### Flow of the Study

The study adhered to the Input-Process-Output model to steer the research. The input phase encompassed the data necessary to address the research problem. This included the learners' profile data as reported by parents, the teachers' profile data, the level of implementation of number-sense activities, the numeracy performance of kindergarten learners, and a test of the relationship between learners' profiles and their numeracy performance.

The process phase involved conducting the major research activities. These included securing approval to carry out the study, distributing and retrieving the questionnaires, recording the required numeracy performance data, coding and tabulating the responses, applying appropriate statistical treatments, and presenting, analyzing, and interpreting the data. The output phase involved developing the Numeracy Skills Enhancement Plan based on the study's findings.

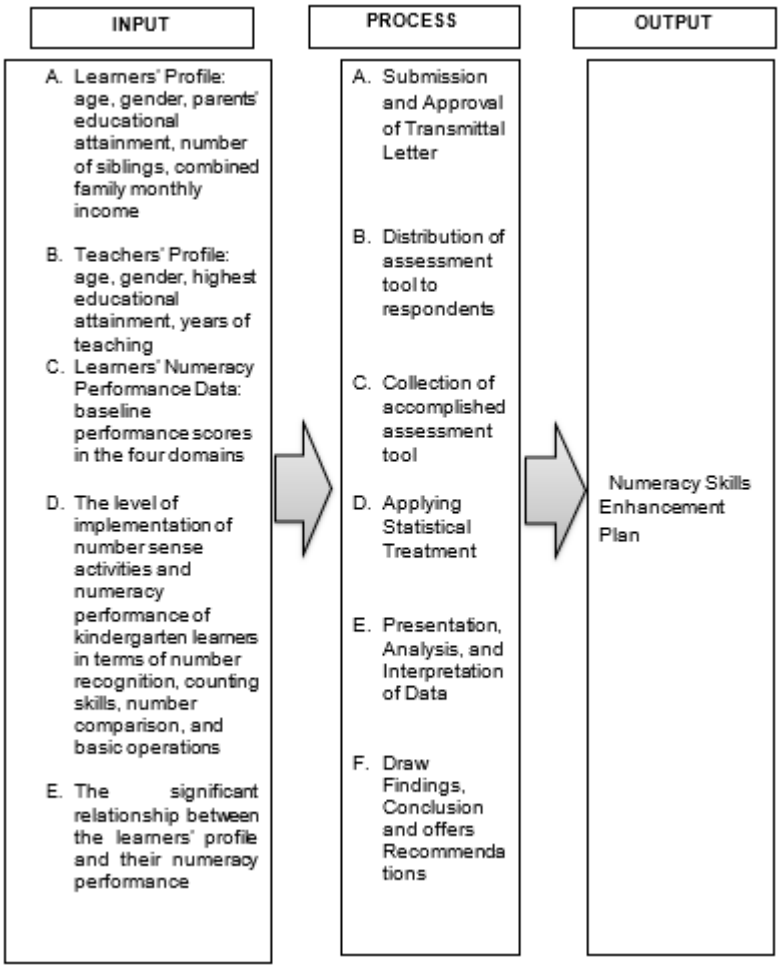


**Figure 2. Flow of the Study**

## Environment

The study was conducted at Tabok Elementary School 1 in Mandaue City, Cebu, Philippines, serving as the site for assessing the implementation of number-sense activities and evaluating the numeracy skills of kindergarten students.

The kindergarten classrooms at Tabok Elementary School 1 provided a learning environment that supported play-based, developmentally appropriate instruction. Teachers used instructional materials such as number charts, flashcards, manipulatives, and other concrete learning tools to facilitate learners' understanding of number recognition, counting, number comparison, and basic operations. Daily classroom activities were designed to actively engage learners in developing early mathematical skills.

The school supported a diverse group of students with different levels of numeracy skills. Although number sense activities were regularly implemented, differences in learners' mastery of basic numeracy skills were still observed. This variation made the setting suitable for examining early numeracy development and for preparing a Numeracy Skills Enhancement Plan based on the study's findings.


**Figure 3. Location Map of the Research Environment**

## Respondents

The respondents of the study included parents or guardians of kindergarten students and kindergarten teachers at Tabok Elementary School 1 in the City Division of Mandaue City during the 2025-2026 School Year. Specifically, there were 160 parent respondents and 4 kindergarten teacher respondents, for a total of 164 participants.

Parent-respondents participated to provide crucial profile information about the learners, such as ages, genders, parents' education levels, number of siblings, and family monthly income. Their input was vital because these profile variables were analyzed in relation to the learners' numeracy skills.

Kindergarten teachers were included because they directly carry out number-sense activities in the classroom. They provided data on how these activities are implemented across areas such as number recognition, counting skills, number comparison, and basic operations. Additionally, they contributed valuable data on learners' numeracy performance, based on the assessment process employed in the study.

The respondents were selected via purposive sampling since they alone could supply the necessary data for the study. The learners were not treated as respondents because they did not answer the

questionnaires. Instead, they served as the subjects of the numeracy performance data, while the responses and assessment records were provided through the parents and teachers.

Table 1. *Distribution of Respondents (n=164)*

| Group | Teachers | Parents | Total | % |
|---|---|---|---|---|
| **A** | 1 | 40 | 41 | 25.00 |
| **B** | 1 | 40 | 41 | 25.00 |
| **C** | 1 | 40 | 41 | 25.00 |
| **D** | 1 | 40 | 41 | 25.00 |
| **Grand Total** | **4** | **160** | **164** | **100.00** |

**Instrument**

The research employed a four-part questionnaire and assessment instrument to gather the required data. The instrument's components were aligned with the problem statement and designed to obtain data from the appropriate respondent group. The instrument covered the profiles of the learners and teachers, the implementation of number sense activities, and the numeracy performance of kindergarten learners.

Part I. Profile of the Learners. The parent-respondents answered this part. It collected learner-related and family background information needed for the study, such as age, gender, parents' highest level of education, number of siblings, and total monthly family income. These data were used to describe the learners' backgrounds and to test the relationship between learners' profiles and numeracy performance.

Part II. Profile of the Teachers. The kindergarten teacher-respondents completed this part. It included items on age and gender, highest educational attainment, and years of teaching. These data were used to describe the teacher-respondents who implemented number sense activities in kindergarten classrooms.

Part III. Implementation of Number Sense Activities. The kindergarten teacher-respondents completed this part. It assessed the level of implementation of number-sense activities across number recognition, counting skills, number comparison, and basic operations. The items were rated using a four-point Likert scale, where 4 indicated Very Highly Implemented, 3 indicated Highly Implemented, 2 indicated Slightly Implemented, and 1 indicated Not Implemented. Teachers assessed each statement based on the consistency of implementing the number sense activity in their classrooms.

Part IV. Numeracy Performance. This part was used to assess the numeracy performance of kindergarten learners in number recognition, counting skills, number comparison, and basic operations. The performance items were recorded using a five-point Likert-type performance rating scale, where 5 meant Outstanding, 4 meant Very Satisfactory, 3 meant Satisfactory, 2 meant Fairly Satisfactory, and 1 meant Did Not Meet Expectations. The teacher-respondents rated or recorded the learners' performance on the numeracy tasks administered during the assessment.

The instrument provided both descriptive and performance-related data. The profile sections supplied categorical data for frequency and percentage analysis. The implementation and numeracy performance sections included scale data, which was analyzed using the weighted mean and standard deviation. The profile variables and the numeracy performance categories were also used in the Chi-square test to determine whether a significant relationship existed between them.

**Data Gathering Procedure**

The data-gathering process for the study entitled "Assessing the Numeracy Performance of Kindergarten Learners Exposed to Number Sense Activities" consisted of three main stages: the

preliminary stage, the data-gathering stage, and the post-data-gathering stage. All activities were conducted in close coordination with the school administration and kindergarten teachers to ensure the study's implementation was organized, ethical, and systematic.

**Preliminary Stage.** Before data collection began, the researcher obtained a formal transmittal letter signed by the Thesis Adviser and the Dean. This letter was duly presented to the Schools Division Superintendent of Mandaue City and the Principal of Tabok Elementary School 1 to request formal authorization to conduct the study. Following approval, the researcher collaborated with the Kindergarten Department to establish the data collection schedule and procedures.

At this stage, orientation sessions were conducted for the parent and teacher respondents. The teacher orientation covered the study's objectives, the contents of the teacher questionnaire, and the steps for completing the instrument. The parents were oriented to the purpose of the learner profile questionnaire and the importance of providing complete and accurate information. The kindergarten learners were also given a child-friendly introduction before the numeracy performance assessment to make them comfortable during the activity.

**Data Gathering Stage**. After all preparatory activities were completed, the researcher administered the research instruments. The profile questionnaire was distributed to the parent-respondents, while the teacher profile and implementation questionnaire were allocated among the four kindergarten teachers. The respondents were provided with adequate time to complete the instruments.

The numeracy performance data were gathered through assessments of kindergarten learners in number recognition, counting skills, number comparison, and basic operations. The assessment was conducted in a child-friendly manner to reduce anxiety and to allow the learners to demonstrate their actual numeracy skills. The needed performance data were then recorded and checked for completeness.

**Post-Data Gathering Stage**. After retrieving all instruments, the researcher organized, coded, and tabulated the data collected. Responses from the parent questionnaire, teacher questionnaire, implementation scale, and numeracy performance record were compiled into a master database. The researcher conducted data checking and cleaning to identify possible errors, inconsistencies, or missing values before statistical analysis.

The data collected were subsequently examined with suitable descriptive and inferential statistical methods. The results were presented, analyzed, and interpreted according to the problem statement. Finally, the findings were combined to form the foundation for creating the Numeracy Skills Enhancement Plan.

**Ethical Considerations**

The study adhered to ethical protocols, as it involved teachers, parents, and kindergarten learners whose numeracy performance data were assessed. The researcher secured all necessary approvals from the appropriate authorities before starting the study.

Informed consent was obtained from the respondents. Parent-respondents were informed about the study's purpose, the use of the learner profile, and the numeracy performance data. Since the learners were minors, parental consent was secured before the assessment. The learners were also given a simple and child-friendly explanation of the activity.

Participation in the study was voluntary. Participants were informed they could decline or withdraw at any time without penalty or consequences. The learners' involvement in the assessment was managed with care and without any pressure.

Anonymity and confidentiality were observed throughout the study. Names of respondents and learners were not disclosed in the final manuscript. Codes were used in place of real names, and the data were kept secure and accessible only to the researcher.

The researcher also observed non-maleficence and beneficence. The assessment activities were conducted in a manner that avoided harm, discomfort, or embarrassment to the learners. The results were used only for research and to prepare the Numeracy Skills Enhancement Plan, which is intended to improve early numeracy instruction.

**Statistical Treatment of Data**

The data gathered in the study were analyzed using frequency counts, percentages, weighted means, standard deviations, and the Chi-square test, are included. Statistical tools were used according to the type of data gathered and the problem being answered.

**Frequency Count.** Frequency counts were utilized to identify the number of respondents or cases in each category**.** It was used to present the learners' profiles as reported by the parents and the teachers' profiles.

**Percentage**. Percentages illustrate how respondents are proportionally distributed across different categories. It helped describe the relative size of each group by age and gender, parents' highest educational attainment, number of siblings, combined family monthly income, teachers' highest educational attainment, and number of years of teaching.

**Weighted Mean**. The weighted mean was used to assess both the extent of number-sense activities implemented and the numeracy performance levels of kindergarten learners. It summarized the responses or ratings for each indicator and domain, particularly number recognition, counting skills, number comparison, and basic operations.

**Standard Deviation**. Standard deviation was employed to assess the variability and consistency of responses and performance ratings. It showed whether the responses were closely clustered around the mean or widely spread across the scale.

**Chi-square Test.** A chi-square test was conducted to assess whether there is a significant association between learners' profiles and their numeracy performance. The test was applied to categorical data and was interpreted at the 0.05 level of significance. If the computed significance value was less than or equal to 0.05, the null hypothesis was rejected. If the computed significance value was greater than 0.05, the null hypothesis was not rejected.

**Scoring Procedure**

The scoring procedure followed the CTU format by providing a separate procedure for each variable measured in the study. The profile variables were treated as categorical data, while the implementation of number sense activities and numeracy performance were interpreted using their respective scales.

For the Learners' Profile as Reported by Parents

| Variable | Scoring or Coding Procedure | Statistical Treatment |
|---|---|---|
| **Age and Gender** | Classified according to the categories checked by the parent-respondents. | Frequency count and percentage |
| **Parents' Highest Educational Attainment** | Classified according to the highest educational level reported for the parents. | Frequency count and percentage |
| **Number of Siblings** | Classified according to the number of siblings reported in the questionnaire. | Frequency count and percentage |
| **Combined Family Monthly Income** | Classified according to the income bracket checked by the parent-respondents. | Frequency count and percentage |

For the Teachers' Profile

| | Scoring or Coding Procedure | Statistical Treatment |
|---|---|---|
| **Age and Gender** | Classified according to the categories checked by the teacher-respondents. | Frequency count and percentage |
| **Highest Educational Attainment** | Classified according to the highest educational qualification reported by the teachers. | Frequency count and percentage |
| **Number of Years of Teaching** | Classified according to the teaching experience bracket reported by the teachers. | Frequency count and percentage |

For the Implementation of Number Sense Activities

| Scale | Numerical Range | Qualitative Description | Verbal Interpretation |
|---|---|---|---|
| **4** | 3.26 - 4.00 | Very Highly Implemented | Number sense activities were implemented with very high consistency. |
| **3** | 2.51 - 3.25 | Highly Implemented | Number sense activities were implemented regularly. |
| **2** | 1.76 - 2.50 | Slightly Implemented | Number sense activities were implemented occasionally. |
| **1** | 1.00 - 1.75 | Not Implemented | Number sense activities were rarely implemented or not implemented at all. |

For the Numeracy Performance of Kindergarten Learners

| Scale | Numerical Range | Qualitative Description | Verbal Interpretation |
|---|---|---|---|
| **5** | 4.21 - 5.00 | Outstanding | The learner demonstrated mastery of the numeracy skill. |
| **4** | 3.41 - 4.20 | Very Satisfactory | The learner demonstrated a high level of numeracy skill. |
| **3** | 2.61 - 3.40 | Satisfactory | The learner demonstrated the basic expected numeracy skill. |
| **2** | 1.81 - 2.60 | Fairly Satisfactory | The learner demonstrated emerging numeracy skill and needed more practice. |
| **1** | 1.00 - 1.80 | Did Not Meet Expectations | The learner needed intensive support with numeracy skills. |

For the Test of Relationship Between the Learners' Profile and Numeracy Performance

A Chi-square test at the 0.05 significance level was used to examine the link between learners' profiles and their numeracy performance. The null hypothesis was rejected when the p-value was below the significance threshold. or equal to 0.05. The null hypothesis was not rejected when the significance value was greater than 0.05.

## DEFINITION OF TERMS

To establish a basis for understanding and interpreting the terms used in this study, the following are defined operationally:

**Basic Operations.** This describes the learner's early skill in performing addition ('putting together') and subtraction ('taking away') tasks with physical manipulatives such as counters or blocks.

**Counting Skills.** This refers to the learner's proficiency in reciting numbers in sequence and applying one-to-one correspondence when touching or moving physical objects during the performance test.

**Implementation Level.** This refers to the frequency and consistency with which number sense activities are integrated into the daily "Blocks of Time," as self-reported by the teacher-respondents on a five-point Likert-scale survey.

**Number Comparison.** This describes the learner's skill to differentiate between "more," "less," and "equal" by comparing two sets of tangible objects or visual representations.

**Number Recognition.** This involves the learner's skill to visually identify, name, and match symbols (0–20) with their verbal names during assessment.

**Number Sense Activities.** This term refers to the specific instructional interventions and hands-on mathematical tasks—such as number-recognition drills, counting with manipulatives, and set comparisons—that kindergarten teachers use to build learners' foundational understanding of quantities.

**Numeracy Performance**. This term represents the demonstrated mathematical capability of kindergarten learners, as measured by their accuracy and speed in completing tasks in the Rapid Mathematics Assessment (RMA).

**Numeracy Skills Enhancement Plan**. This is the final output of the research, consisting of a proposed set of localized instructional strategies and curated mathematical activities designed to address the specific performance gaps identified in learners' data.

## CHAPTER 2

## REVIEW OF LITERATURE AND STUDIES

This chapter provides an updated review of the existing literature and research on number sense activities and the numeracy skills of kindergarten students. The discussion retained the major ideas already included in the manuscript, particularly the focus on early numeracy, number sense, play-based mathematics, teacher implementation, and the proposed Numeracy Skills Enhancement Plan. It also expanded the definitions of the study variables, included more scholarly studies, strengthened the Philippine policy and classroom context, and established the research gap that justifies the present investigation at Tabok Elementary School 1.

### Related Literature

Early mathematical success is rooted in a strong number sense, or the child's intuitive and conceptual understanding of quantities, numerals, numerical relationships, and simple operations. Jordan argued that number competence in kindergarten predicts later mathematics outcomes; Duncan identified early mathematics knowledge as a key predictor of future academic success. These results reinforce the view that kindergarten numeracy serves not just as an initial skill but as a critical basis for subsequent school achievement. For the present study, number sense is treated as a core instructional area because it integrates number recognition, counting skills, number comparison, and basic operations into a single developmental pathway.

Number sense activities refer to structured, teacher-facilitated, and developmentally appropriate tasks that help children understand numbers through concrete, visual, verbal, and symbolic experiences. In this study, the level of implementation of number sense activities is the independent instructional variable. It includes the extent to which kindergarten teachers use activities for number recognition, counting skills, number comparison, and basic operations. These activities may involve number cards, counters, blocks, songs, games, classroom routines, mathematical stories, guided play, and real-life problem situations. Almulhim and Fujita emphasized that kindergarten learners can strengthen number sense when mathematical ideas are introduced through meaningful stories and interactive

experiences. Byrne also observed that physical manipulatives can enhance children's learning when used with specific instructional objectives rather than simply as play objects.

Numeracy performance, the study's dependent variable, refers to the learner's demonstrated ability to perform early mathematical tasks accurately. In the present study, numeracy performance covers the same four domains used in number sense implementation: number recognition, counting skills, number comparison, and basic operations. This alignment is important because it enables the researcher to assess whether the areas emphasized by teachers are reflected in the learners' actual performance. Ghazali [12] stressed that definitions of number sense vary across studies, but most include symbolic number knowledge, counting, magnitude comparison, and early operations. This supports the decision to use these four domains as the structure of both instruction and assessment.

**Number Recognition**

Number recognition is the learner's ability to identify written numerals, name them, and connect symbols with quantities or real objects. In early childhood mathematics, number recognition is not limited to seeing and naming a numeral. It also includes understanding that the symbol represents a quantity and can be used in counting, comparing, and solving simple problems. Without this ability, learners may count orally but fail to connect spoken numbers with written symbols. Nurmulkiah and Chamidah [13] highlighted contextual learning as one way to strengthen number recognition because children understand numerals better when these are connected with familiar objects and classroom situations. In the present study, number recognition activities include using number cards, visual aids, classroom objects, and daily routines, in which learners identify numerals and match them to quantities.

The Philippine kindergarten classroom places a strong emphasis on number recognition because children enter school with varying levels of exposure to printed numbers at home. Some children may see numbers on calendars, cellphones, prices, jeepney signs, or household materials, while others may have limited exposure to printed learning resources. This makes the teacher's role important in providing repeated, meaningful, and concrete encounters with numerals. In the present study, number recognition is assessed both as an implemented activity reported by teachers and as a learner performance domain. This makes it possible to determine whether classroom practices are sufficient to support symbolic number understanding among kindergarten learners.

**Counting Skills**

Counting skills refer to the learner's ability to recite number words in proper sequence, apply direct one-to-one mapping, identify the total number of objects counted, and continue or reverse number sequences when developmentally appropriate. Counting appears simple, but it requires coordination of memory, attention, language, and motor control. Children must know the stable order of number words, point to each object only once, and understand that the final number word indicates the total amount. Akther [14] showed, through a research synthesis, that counting-focused interventions can help learners who have trouble with mathematics. This supports the inclusion of counting skills as a major domain in the present study.

In kindergarten, counting should be taught through movement, songs, object counting, peer interaction, and routine-based activities. Learners count steps, snacks, blocks, crayons, classmates, and toys. These activities help them see counting as a practical mathematical act rather than a memorized chant. However, counting instruction must be monitored carefully because some children can recite numbers but skip objects, count one object twice, or fail to state the cardinal value. For this reason, the present study assessed counting skills not only through teacher reports of implementation but also through learner performance tasks that require children to count actual objects and respond to oral prompts.

**Number Comparison**

Number comparison refers to the learner's ability to determine which set or numeral is more, less, fewer, greater, smaller, or equal. This domain is a central part of number sense because it develops the child's understanding of magnitude and numerical relationships. Compared with number recognition and simple counting, number comparison requires children to think relationally. They must look at two quantities, determine whether they are equal or different, and sometimes explain their decision. Er and Artut [15] showed that number sense performance is closely connected with problem-solving strategies, which suggests that comparison tasks help children move from naming numbers to reasoning about numbers.

Number comparison is often a weak area for young learners because the idea of "more" or "less" may be affected by the arrangement, size, or spacing of objects. A learner may think a longer row has more objects even when both groups have the same number. This is consistent with Piagetian ideas about preoperational thinking, in which young children often rely on visual appearance. For the present study, number comparison is important because it connects concrete experiences with early mathematical reasoning. Activities may include comparing blocks, arranging numbers from smallest to largest, matching numerals to sets of objects, and using greater-than, less-than, and equal-to signs in age-appropriate ways.

**Basic Operations**

Basic operations in kindergarten refer to early experiences with putting together, adding, taking away, and subtracting through concrete objects and simple story situations. At this stage, operations should not be presented as abstract written computation. Instead, learners should use fingers, counters, blocks, toys, drawings, and real-life events to understand that numbers can change when objects are added or removed. Purpura and Lonigan emphasized that informal numeracy includes numbering, relations, and arithmetic operations, showing that early operation skills are part of the broader structure of preschool numeracy.

The present study includes basic operations because kindergarten learners must gradually develop the idea that mathematics can solve simple real-life problems. Examples include combining two groups of objects, sharing snacks, removing toys from a group, or counting how many remain. These activities strengthen problem-solving and prepare learners for Grade 1 mathematics. However, operations must be developmentally appropriate. When teachers move too quickly to abstract symbols, learners may memorize answers without understanding what addition or subtraction means. Thus, the study examines whether teachers implement basic operations activities using hands-on and guided strategies and whether learners demonstrate corresponding performance on simple operations tasks.

**Teacher Implementation of Number Sense Activities**

The implementation of number sense activities depends strongly on the teacher's ability to choose tasks, sequence concepts, use concrete materials, ask guiding questions, and adjust instruction to the learner's developmental level. Vygotsky's Socio-Cultural Theory supports this view because children learn through scaffolded interaction with a more knowledgeable person. In kindergarten mathematics, the teacher helps children move from informal experiences to more formal mathematical understanding. Baron [16] found that teacher interactions in early childcare settings can be improved through intervention and that activity settings shape math-specific interactions. This supports the idea that the quality of teacher implementation is as important as the presence of activities.

Teacher implementation also involves monitoring. It is not enough to provide manipulatives or games. Teachers must observe whether children are counting correctly, recognizing numerals, comparing quantities, or understanding simple operations. Doabler highlighted the crucial role of explicit instructional interactions in kindergarten math interventions. This means that effective number sense teaching requires a balance between play and direct guidance. The present study

therefore examines how frequently and consistently teachers implement activities across the four number sense domains.

**Home and Learner Profile Factors in Numeracy Performance**

The learner's profile is also relevant to numeracy performance. In the present study, the learner profile includes age, gender, parents' highest educational attainment, number of siblings, and combined family monthly income. These variables are not treated as instructional variables, but they provide context for understanding differences in numeracy performance. Children enter kindergarten with different experiences, resources, language exposure, parental support, and learning opportunities. Soto-Calvo [17] found that home learning experiences predict early number skills, while Young [18] demonstrated that family math activities enhance preschool mathematics learning. These findings indicate that the home environment can either support or hinder classroom-based numeracy development.

In the Philippine setting, home support may vary due to socioeconomic conditions, parental work schedules, access to learning materials, and educational background. Some families may provide books, flashcards, digital learning tools, and guided practice, while others may depend almost entirely on school-based instruction. This makes the inclusion of learner profile variables meaningful. It allows the study to determine whether selected background characteristics are significantly related to numeracy performance and whether the proposed enhancement plan should include home-friendly, low-cost, and parent-guided activities.

**Philippine Context of Kindergarten Numeracy**

In the Philippine context, kindergarten is legally and pedagogically positioned as a foundation for school readiness. Republic Act No. 10157, known as the Kindergarten Education Act, establishes kindergarten as a fundamental part of the basic education system and promotes developmentally suitable learning experiences for young Filipino children. Similarly, Republic Act No. 10533, or the Enhanced Basic Education Act of 2013, enhances the continuity of learning within the K to 12 framework. Additionally, DepEd Order No. 47, s., highlights the significance of kindergarten learning blocks, play-based teaching methods, learning materials, and child-centered approaches. These policies underpin the current study because activities focused on number sense support the goal of concrete, active, and developmentally appropriate early education.

The MATATAG Curriculum also gives renewed attention to foundational skills, including mathematics. For kindergarten learners, this means that early numeracy skills must be strengthened before they move on to more formal primary-grade tasks. In many Philippine public schools, however, learners may come from homes with varying levels of learning support and access to materials. Therefore, localized number sense activities are needed. The present study addresses this need by assessing the implementation of number-sense activities and learners' numeracy performance at Tabok Elementary School 1. Its output, a Numeracy Skills Enhancement Plan, is intended to provide practical, localized, and evidence-based strategies that can address observed gaps.

**Related Studies**

Duncan performed a comprehensive longitudinal study using multiple school readiness datasets to identify early skills that forecast future achievement. The methodology was correlational and longitudinal, using standardized measures of school-entry skills and later academic outcomes. The instruments included assessments of early mathematics, reading, attention, and socioemotional behaviors. The results indicated that early mathematics skills are among the strongest predictors of future achievement, surpassing several other readiness indicators. The study recommended that early education programs give serious attention to mathematics readiness, not only literacy. This supports the present study, as kindergarten numeracy performance is considered a foundation for later academic success.

Jordan et al. explored how kindergarten number skills relate to future math achievements, employing a longitudinal approach that tracked students from kindergarten through subsequent grades. The instruments included number competence tasks that measured counting, number knowledge, numerical relationships, and arithmetic-related skills. The findings revealed that kindergarten number competence significantly predicted later mathematics performance. The study recommended early identification of learners with weak number sense and targeted intervention before difficulties become more serious. This directly supports the present study because number recognition, counting skills, number comparison, and basic operations are used as central domains of numeracy performance.

Purpura and Lonigan. Purpura and Lonigan investigated the structure of informal numeracy skills among preschool children. The methodology was quantitative and psychometric, examining how different early numeracy skills were related to one another. The instruments measured numbering, numerical relations, and arithmetic operations. The findings showed that informal numeracy is not just a single skill. It is a group of related topics or competencies, including counting, comparison, and simple operations. The study recommended that early mathematics assessment and instruction should not focus only on rote counting. This is pertinent to the current study because the variables are divided into four domains rather than treated as one general numeracy score.

Clements and Sarama cited Clements and Sarama [19], who assessed a research-based preschool mathematics curriculum using an experimental approach. The intervention emphasized learning trajectories, manipulatives, classroom activities, and teacher-guided mathematical experiences. The instruments included early mathematics assessments aligned with developmental learning goals. The findings showed that children exposed to the curriculum gained stronger mathematical knowledge than those in comparison groups. The study recommended that early childhood mathematics be organized around sequenced, developmentally appropriate activities rather than isolated drills. This supports the present study because number sense activities must be consistently implemented and properly sequenced to improve numeracy performance.

Ramani and Siegler investigated whether engaging preschool children from low-income backgrounds in number board games could enhance their numerical skills. They used an experimental approach, comparing children who played linear number board games with those engaged in other activities. The instruments included tasks on numeral identification, counting, magnitude comparison, and number line estimation. The results indicated significant and consistent enhancements in children's understanding of numbers after engaging with number board games. The study recommended using simple, low-cost games to support early numeracy, especially among learners with limited home resources. This is useful for the present study because number sense activities can be playful, concrete, and accessible.

Siegler and Ramani. Siegler and Ramani compared the effects of linear and circular number board games on preschool children's numerical understanding. The methodology was experimental, with children assigned to different game conditions. The instruments assessed number line estimation, numeral recognition, counting skills, and understanding of numerical magnitude. The findings showed that linear board games were more effective than circular ones because they helped children understand the ordered, spatial nature of numbers. The study recommended that early numeracy games be designed carefully so that their structure supports the target concept. This is relevant to the present study because number-sense activities must be purposeful rather than merely entertaining.

Dyson Dyson investigated a number-sense intervention for low-income kindergarten students at risk of developing math difficulties. The methodology used an intervention-based assessment with small-group instruction. The instruments included number-sense and early-calculation measures that assessed counting, number knowledge, comparison, and arithmetic readiness. The findings showed that targeted number sense instruction improved learners' early mathematics performance. The study recommended early screening, small-group intervention, and explicit instruction for learners who

demonstrate weak foundational numeracy skills. This supports the current study by identifying weak areas and utilizing the results to develop an improvement plan.

Doabler investigated the quantity and quality of explicit instructional interactions in a validated Tier 2 kindergarten mathematics intervention. The methodology involved structured observation and measurement of instructional interactions during intervention lessons. The instruments included observation tools that captured teacher modeling, guided practice, feedback, and learner opportunities to respond. The findings showed that explicit and high-quality instructional interactions are important in mathematics intervention. The study recommended strengthening teacher delivery, feedback, and monitoring during early mathematics instruction. This relates to the current study because the extent of implementing number sense activities hinges on teachers' actual classroom instruction.

Aunio [20] al.conducted early numeracy interventions aimed at first-graders at risk of math difficulties. Their approach was intervention-focused and quantitative, targeting students requiring extra support in early numeracy skills. The instruments measured number knowledge, counting, relational skills, and arithmetic-related performance. The findings indicated that structured early numeracy intervention can improve mathematical learning among at-risk children. The study recommended explicit, systematic, and developmentally appropriate support for learners with weak numeracy foundations. Although the participants were first-graders, the study is relevant to kindergarten because early weaknesses in number sense can continue into the primary grades if not addressed early.

De Chambrier investigated how a play-based intervention influenced children's numerical skills both in kindergarten and at home. Their quasi-experimental study involved activities at school and home aimed at enhancing number skills. The study involved numerical skills assessments conducted both before and after the intervention. Results showed that incorporating play-based activities can enhance children's numerical skills, especially when such activities connect classroom learning with home practice. The study recommended involving families and using play-based materials that children can use in familiar settings. This supports the present study because the enhancement plan may include classroom- and home-friendly number sense activities.

Braak [21] explored why early mathematics skills forecast later success in mathematics and reading, focusing on the influence of executive function. The methodology was longitudinal, observing children's early skills and their subsequent academic results. The instruments included measures of early mathematics, reading, and executive function. The findings showed that executive function partly explains why early mathematics skills predict later achievement. The study recommended that early mathematics instruction also support attention, working memory, and self-regulation. This is relevant to the present study because kindergarten number sense activities require children to listen, attend, remember steps, compare objects, and solve simple problems.

Soto-Calvo explored how preschool home learning experiences forecast early number skills. Their longitudinal study involved preschool children and their parents. The instruments included parent questionnaires on home learning experiences and child assessments of counting, number transcoding, calculation, language, and nonverbal abilities. The findings showed that home experiences were associated with growth in early number skills, even after accounting for other child abilities. The study recommended strengthening home learning support and helping parents provide simple number-related activities. This supports the inclusion of learner profile variables and parent-related information in the present study.

Young studied a family math intervention among Head Start preschool children. The methodology involved a school- and home-based approach to mathematics support. The instruments included child mathematics assessments, family activity measures, and implementation records. The findings showed that adding family math activities helped promote preschoolers' mathematics learning at home and school. The study recommended family engagement, simple take-home activities, and

guidance for parents to support early mathematics learning outside the classroom. This is relevant to the current study because a learner's numeracy skills may be affected by parents' education levels, family income, and home environment.

Byrne conducted a scoping review of educational interventions that use physical manipulatives to support children's learning and development. The methodology followed review procedures to map existing studies that used concrete materials in educational interventions. The instruments were study selection criteria, extraction tools, and thematic analysis of intervention characteristics and outcomes. The findings showed that manipulatives can support learning when used intentionally and aligned with clear learning objectives. The study recommended that teachers avoid using manipulatives only for decoration or free play. This supports the present study because number sense activities should use concrete objects with a guided mathematical purpose.

Hui and Mahmud [22] carried out a systematic review on how game-based learning impacts students' cognitive and emotional aspects in mathematics education. The methodology was review-based, drawing on selected studies of game-based mathematics learning. The instruments included screening criteria and review protocols to identify, classify, and analyze related studies. The results indicated that when aligned with learning goals, game-based learning can enhance students' mathematical comprehension and increase their motivation and engagement. The study recommended integrating games into mathematics instruction with clear objectives and assessment. This is relevant to kindergarten because number sense activities often use games to teach recognition, counting, comparison, and operations.

Siller and Ahmad [23] investigated how blended instruction with concrete and virtual manipulatives impacts mathematical achievement. Their intervention-based study compared learning environments that incorporated manipulatives. They used measures of math achievement and instructional tools with concrete and virtual visuals. Results indicated that integrating both types of manipulatives enhances math performance more than traditional methods. The authors recommended that teachers connect physical manipulatives with visual and symbolic representations. This aligns with the current research, as kindergarten students gain from transitioning from physical objects to pictures and symbols.

Baron examined an intervention aimed at enhancing both overall and math-specific teacher-toddler interactions in early childcare environments. The study used an intervention-based design and focused on the quality of teacher interactions across activity settings. Instruments included observation tools for teacher-child interaction and math-specific communication. The findings showed that teacher interactions can be strengthened through professional support and that math talk depends on the activity context. The study recommended teacher training to help early childhood educators recognize mathematical opportunities in daily routines. This is relevant to the present study because the implementation of number sense activities depends on teacher practice, not only on available materials.

Foster [24] investigated the effectiveness of supplemental computer-assisted mathematics instruction in elementary schools by conducting a conceptual replication. The methodology involved quantitative evaluation of an instructional support program. The instruments included mathematics achievement measures and implementation data connected with computer-assisted instruction. The findings showed that supplemental instruction can contribute to mathematics learning when it is aligned with classroom needs and implemented with fidelity. The study recommended careful selection of digital tools and continued teacher guidance. Although the present study focuses primarily on hands-on kindergarten activities, it supports the broader point that instructional tools are effective only when they are matched to learner needs and monitored by teachers.

**Philippine-Based Literature and Local Studies**

Philippine-based literature underscores the need for the present study, as national policy, classroom realities, and home conditions shape kindergarten numeracy. The Kindergarten Education Act and the Enhanced Basic Education Act emphasize the significance of establishing strong early learning foundations. Additionally, DepEd Order No. 47, s., promotes play-based and developmentally suitable kindergarten teaching methods. These policies are consistent with the study's focus on hands-on number-sense activities, as young Filipino learners benefit from concrete, localized, and teacher-guided experiences before moving on to more formal mathematics in the primary grades.

The manuscript also retained local and context-based sources such as Dulay, Sabasaje and Oco, and Tayaban. Dulay's work is relevant because the present study adapted elements of the Rapid Mathematics Assessment approach, which uses task-based assessment to identify strengths and weaknesses in numeracy performance. Sabasaje and Oco are relevant to the Philippine discussion because their work connects mathematical skills with learner performance. Tayaban is also useful because it highlights numeracy challenges among kindergarten learners in a Philippine locality. These studies point to the same practical concern: Filipino learners may be exposed to mathematics activities, but their actual performance may still vary across number recognition, counting, comparison, and operations. The local evidence remains limited, which strengthens the need for the present study in Mandaue City.

Compared with the international literature, the Philippine-based evidence on kindergarten number sense remains narrower. Many available local works focus on general mathematics performance, primary-grade numeracy, or intervention programs, while fewer studies examine kindergarten number sense using parallel domains of implementation and performance. This creates a local research gap. This study fills the gap by directly evaluating how kindergarten teachers implement number-sense activities and how learners perform in numeracy within the same content areas. It also investigates whether learner profile variables are significantly associated with numeracy performance, thereby making the research more relevant to local school and family contexts.

**Synthesis of the Reviewed Literature and Studies**

The reviewed literature and studies show four major patterns. First, early understanding of mathematics and number sense are key indicators of future academic success. Studies by Duncan and Jordan and Braak show that early numeracy has long-term importance. This means that kindergarten mathematics should not be treated solely as simple preparation. It is a critical foundation for future learning. The present study is connected to this finding because it assesses the numeracy performance of kindergarten learners before mathematical difficulties become more difficult to remediate.

Second, number sense is multidimensional. Purpura and Lonigan and Ghazali show that number sense includes several related but distinct skills. These include symbolic number knowledge, counting, comparison, understanding of magnitude, and operations. This supports the present study's use of four domains: number recognition, counting skills, number comparison, and basic operations. The use of these domains makes the study more precise than a general assessment of numeracy, as it can identify which areas are stronger and which require intervention.

Third, research consistently indicates that young children grasp mathematics more effectively through concrete, playful, and guided experiences. Studies by Clements and Sarama, Ramani and Siegler [25], De Chambrier, Byrne, and Hui and Mahmud emphasize the importance of games, manipulatives, guided play, and structured tasks. Nonetheless, these materials alone are insufficient; teachers must link activities to explicit mathematical goals. Therefore, this study focuses on implementation rather than just material availability.

Fourth, the reviewed studies show the importance of teacher support and home context. Doabler and Baron emphasize teacher interactions, feedback, and math talk. Soto-Calvo and Young show that family activities and home learning experiences can strengthen early number skills. These findings support the inclusion of teacher-reported implementation and learner profile variables in the present

study. Since learners come from different family backgrounds, it is necessary to examine whether profile characteristics are related to their numeracy performance.

### Critical Analysis and Research Gap

Although the reviewed literature offers substantial evidence concerning the importance of early numeracy, several gaps remain. Numerous international studies predominantly focus on interventions conducted during preschool or primary education; however, fewer investigations explore the implementation of number sense in kindergarten and the related learner outcomes within the context of Philippine public schools. Some studies assess early mathematical achievement, while others emphasize specific interventions such as board games, manipulatives, or family mathematics activities. The present study distinguishes itself by encompassing four domains of number sense and correlating teacher implementation with learner performance. This alignment enhances the practical utility of the research for school-based planning by facilitating the identification of whether instructional practices and learner outcomes highlight the same areas of strength or weakness.

Another notable gap pertains to the scarcity of Philippine-based studies that specifically scrutinize domains such as number recognition, counting skills, number comparison, and fundamental operations among kindergarten learners. Although local studies and reports raise concerns about numeracy, many lack domain-specific analyses at the kindergarten level. This is particularly significant because a child may excel in counting yet perform poorly in number comparison or recognize numbers but encounter difficulties with basic operations. Without domain-specific evidence, the development of targeted enhancement plans may become overly generalized. The current study addresses this gap by employing specific domains both for the implementation of number sense activities and for the assessment of numeracy performance.

Another gap exists in understanding how learner profiles impact numeracy performance. While global research highlights the importance of home learning and family support, there is limited local data on how factors such as age, gender, parental education, siblings, and household income influence Filipino kindergarteners' numeracy skills. This study aims to investigate these variables in relation to numeracy outcomes, allowing for the development of a more targeted improvement plan that better addresses the needs of learners and families at Tabok Elementary School 1.

### Connection to the Present Study

The review of existing literature and studies substantiates the rationale for the current investigation. Early numeracy is crucial for subsequent academic achievement. The construct of number sense comprises several interconnected skills. Young children learn most effectively through concrete, playful, and guided experiences. Both teacher implementation and home environment significantly influence learning outcomes. These points directly support the study’s aim of evaluating the numeracy performance of kindergarten learners engaged in number sense activities at Tabok Elementary School 1. The results will serve as a foundation for developing a Numeracy Skills Enhancement Plan tailored to address the specific domains in which learners demonstrate the greatest need for support.

This study adds to the existing literature by offering evidence from a kindergarten classroom in the Philippines. not only describes general numeracy performance. It examines specific number sense domains, teacher implementation, learner performance, and learner profile factors. This makes the study useful for teachers, school administrators, parents, and curriculum implementers because the proposed enhancement plan will be grounded in actual classroom and learner data. The study therefore connects international evidence on early numeracy with local needs in Mandaue City.

## CHAPTER 3

## PRESENTATION, DATA ANALYSIS, AND INTERPRETATION

This chapter presents, analyzes, and interprets data gathered from parent-respondents and teacher-respondents at Tabok Elementary School 1. The discussion is organized around the study's specific problems and focuses on the learners' profile, teachers' profile, implementation of number sense activities, numeracy performance of kindergarten learners, and the relationship between learners' profile and numeracy performance. Each table is presented in an editable format and is followed by analysis, interpretation, implications, and supporting literature drawn from the study's reviewed sources.

**Parent Respondents**

The first set of tables presents the profile information provided by the parents of kindergarten learners. These data describe the background conditions surrounding the learners, particularly age, gender, parents' educational attainment, number of siblings, and combined family monthly income. These profile variables are important because they help explain the context in which early numeracy learning takes place. They also serve as the basis for examining whether selected learner-related factors are associated with numeracy performance.

**Age and Gender**

Age and gender provide a basic description of the kindergarten learners included in the study. Age is especially relevant in early childhood education because learners at the kindergarten level may differ in readiness, attention span, language development, and ability to follow mathematical instructions. Gender is also included to determine whether both male and female learners were represented in the assessment of numeracy performance. The distribution of learners by age and gender is shown in Table 2.

Table 2. *Age and Gender of the Learners*

| Age (in years) | Female f | Female % | Male f | Male % | Total f | Total % |
|---|---|---|---|---|---|---|
| **5** | 31 | 19.38 | 36 | 22.50 | 67 | 41.88 |
| **6** | 40 | 25.00 | 50 | 31.25 | 90 | 56.25 |
| **7** | 1 | 0.63 | 2 | 1.25 | 3 | 1.88 |
| **Total** | 72 | 45.00 | 88 | 55.00 | 160 | 100.00 |

Table 2 shows that most kindergarten learners were six years old, with 90 learners, or 56.25 percent of the total population. The second-largest group was composed of five-year-old learners, with 67 learners, or 41.88 percent, while only 3 learners, or 1.88 percent, were seven years old. In terms of gender, there were 88 male learners, or 55.00 percent, and 72 female learners, or 45.00 percent. This indicates that the study involved learners who were mostly within the expected kindergarten age range, with only a small number of older learners.

The concentration of learners at five and six years old suggests that the respondents were generally at the developmental stage where foundational number concepts are actively forming. Six-year-old learners may already show greater readiness for structured tasks, while five-year-old learners may still need more concrete, repeated, and guided activities. The small number of seven-year-old learners does not change the overall age pattern, but it reflects the natural variation often found in early childhood classrooms. The gender distribution also shows that both male and female learners were adequately represented, although male learners slightly outnumbered female learners.

This result implies that age must be considered when interpreting numeracy performance because even a small difference in age may affect attention, memory, task persistence, and ability to understand number relationships. Younger learners may require more manipulatives and teacher-guided support, while older learners may be ready for activities involving comparison, ordering, and basic operations. Braak explained that early mathematics skills are connected with executive function, which includes attention and working memory. NAEYC [26] also emphasizes that early childhood

instruction should be developmentally appropriate, which supports the need to align number sense activities with learners' age and readiness.

**Highest Educational Attainment**

Parents' highest educational attainment gives insight into the educational support that may be available at home. This variable does not measure the quality of parenting, but it provides a useful background for understanding how learners may be guided outside the classroom. Parents with different educational backgrounds may vary in their confidence, time, and familiarity with school-related learning tasks. Table 3 presents the educational attainment of the learners' mothers and fathers.

Table 3. *Parents' Highest Educational Attainment*

| Educational Attainment | Mother f | Mother % | Father f | Father % |
|---|---|---|---|---|
| **Doctorate Graduate** | 1 | 0.63 | 0 | 0.00 |
| **With Doctorate Units** | 0 | 0.00 | 0 | 0.00 |
| **Master's Graduate** | 0 | 0.00 | 0 | 0.00 |
| **With Master's Units** | 0 | 0.00 | 1 | 0.63 |
| **College Graduate** | 18 | 11.25 | 21 | 13.13 |
| **College Level** | 34 | 21.25 | 23 | 14.38 |
| **High School Graduate** | 82 | 51.25 | 63 | 39.38 |
| **High School Level** | 12 | 7.50 | 25 | 15.63 |
| **Elementary Graduate** | 4 | 2.50 | 5 | 3.13 |
| **Elementary Level** | 4 | 2.50 | 17 | 10.63 |
| **No Formal Education** | 3 | 1.88 | 0 | 0.00 |
| **No Response** | 2 | 1.25 | 5 | 3.13 |
| **Total** | 160 | 100.00 | 160 | 100.00 |

Table 3 indicates that among mothers, the most common educational attainment was high school graduation, accounting for 82 or 51.25 percent. This was followed by mothers who attained college level, totaling 34 or 21.25 percent, and those who were college graduates, at 18 or 11.25 percent. Among fathers, the largest group also comprised high school graduates, with 63 or 39.38 percent, with subsequent categories including those who reached high school, college, and college graduate levels. The data suggest that most parents had at least basic formal schooling, while only a smaller portion reached college completion or graduate-level education.

The distribution indicates that many learners came from homes where parents may be able to support basic learning tasks but may not always have extensive preparation for structured early numeracy instruction. Mothers showed a stronger concentration in the high school graduate category, while fathers were more widely distributed across high school level, high school graduate, college level, and college graduate categories. This pattern suggests varied home learning conditions among the learners. Some families may be able to provide stronger academic guidance, while others may depend more on school-based learning experiences.

This result implies that number sense activities should be designed so that parents can understand and support them regardless of educational background. Home reinforcement may be strengthened through simple tasks such as counting household objects, identifying numerals in daily materials, sorting items, and comparing quantities during routines. Young highlighted that family-based math activities can support preschoolers' learning both at home and in school. For this study, the Numeracy Skills Enhancement Plan should feature activities that are easy for parents to understand and do, without needing advanced mathematical skills.

**Number of Siblings**

The number of siblings describes the family structure of the kindergarten learners. This information helps explain the possible distribution of attention, materials, and learning opportunities within the home. A child with several siblings may share time and resources with others, while a child with few or no siblings may receive more individualized adult attention. Table 4 presents the learners' number of siblings.

Table 4. *Learners' Number of Siblings*

| Number of Siblings | f | % |
|---|---|---|
| **5 and up** | 12 | 7.50 |
| **3-4** | 29 | 18.13 |
| **1-2** | 96 | 60.00 |
| **None** | 23 | 14.38 |
| **Total** | 160 | 100.00 |

Table 4 shows that the largest group of learners had 1 to 2 siblings, with 96 learners, or 60.00 percent. Learners with no siblings followed, with 23 or 14.38 percent, while those with 3 to 4 siblings accounted for 29 or 18.13 percent. Only 12 learners, or 7.50 percent, had 5 or more siblings. Overall, most learners came from households with a relatively small number of children.

The results indicate that many learners may have home environments where parental attention and support remain manageable. Having 1 to 2 siblings may allow children to interact with peers while still receiving guidance from adults. However, learners from larger households may experience shared attention, shared learning materials, and less individualized assistance. This situation does not automatically limit learning, but it suggests that home-based support may vary depending on family size and daily household routines.

This finding implies that the enhancement plan should include activities that can be done individually, with parents, or with siblings. Shared counting games, sorting objects, matching number cards, comparing household items, and simple addition games can turn the presence of siblings into a learning opportunity rather than a limitation. De Chambrier discovered that incorporating play-based numerical activities in both kindergarten and home environments can improve children's numerical skills. This highlights the importance of creating adaptable number sense activities that children can practice outside of school.

**Combined Family Monthly Income**

Combined family monthly income provides additional context on the possible availability of learning resources at home. Income may affect access to books, printed materials, digital tools, enrichment activities, and other materials that can support early numeracy learning. However, low-cost and everyday materials may also be used effectively when activities are well-designed. The income profile of the learners' families is shown in Table 5.

Table 5. *Learners' Combined Family Monthly Income*

| Monthly Income (in pesos) | f | % |
|---|---|---|
| **above 30,000** | 22 | 13.75 |
| **25,001-30,000** | 9 | 5.63 |
| **20,001-25,000** | 17 | 10.63 |
| **15,001-20,000** | 31 | 19.38 |
| **10,001-15,000** | 27 | 16.88 |
| **10,000 and below** | 54 | 33.75 |
| **Total** | 160 | 100.00 |

Table 5 shows that most learners come from families earning 10,000 pesos or less, representing 54 learners or 33.75%. The next largest group is from families earning between 15,001 and 20,000 pesos, with 31 learners (19.38%), followed by those earning 10,001 to 15,000 pesos, totaling 27 learners (16.88%). Families earning over 30,000 pesos number 22, or 13.75%. The rest of the families are spread across middle-income brackets.. The data suggest that a significant proportion of learners originate from families with limited monthly income.

**Teacher Respondents**

Table 6. *Age and Gender of the Teachers*

| Age (in years) | Female f | Female % | Male f | Male % | Total f | Total % |
|---|---|---|---|---|---|---|
| **above 33** | 1 | 25.00 | 0 | 0.00 | 1 | 25.00 |
| **30-33** | 1 | 25.00 | 0 | 0.00 | 1 | 25.00 |
| **26-29** | 2 | 50.00 | 0 | 0.00 | 2 | 50.00 |
| **Total** | 4 | 100.00 | 0 | 0.00 | 4 | 100.00 |

Table 6 shows that all 4 teacher-respondents, or 100.00 percent, were female. In terms of age, 2 teachers, or 50.00 percent, were 26 to 29 years old; 1 teacher, or 25.00 percent, was 30 to 33 years old; and 1 teacher, or 25.00 percent, was above 33 years old. No male teachers were included among the respondents. The data indicate that the kindergarten teachers were mostly young adults, with some representation from older age categories.

The distribution suggests that the teaching group may combine early-career energy with some degree of teaching maturity. Younger teachers may be more open to interactive strategies such as games, songs, movement, digital tools, and classroom-made materials. Teachers in older age brackets may contribute pacing, classroom management, and practical knowledge from accumulated teaching experience. Since all respondents were female, gender-based comparisons among teachers cannot be made; however, the data still provide a clear description of the group of teachers who implemented the activities.

This finding implies that the quality of implementation may depend less on teacher gender and more on instructional preparation, responsiveness, and the ability to provide guided mathematical experiences. Baron highlighted the significance of teacher-child interactions in early math environments, especially regarding how teachers organize engaging activities. NAEYC also stresses that developmentally appropriate practice requires teachers to respond to children's age, readiness, and learning needs. Hence, the teacher profile supports the need for training that strengthens classroom interaction and numeracy facilitation.

**Highest Educational Attainment**

Teachers' educational attainment provides information on their formal preparation for classroom instruction. In early childhood education, academic preparation may influence how teachers understand child development, assessment, instructional planning, and the use of developmentally appropriate strategies. This profile is relevant because the study examined teacher-reported implementation of number sense activities. Table 7 presents the highest educational attainment of the kindergarten teachers.

Table 7. *Teachers' Highest Educational Attainment*

| Highest Educational Attainment | f | % |
|---|---|---|
| **With Master's Units** | 3 | 75.00 |
| **Bachelor's Degree** | 1 | 25.00 |
| **Total** | 4 | 100.00 |

Table 7 indicates that 3 teachers (75.00%) had completed graduate units, whereas 1 teacher (25.00%) possessed only a bachelor's degree. This shows that all respondents met the basic teaching qualification, and the majority pursued graduate studies. The findings imply that most teachers continued their professional development, which likely supports their understanding of curriculum alignment, assessment strategies, and the significance of structured number sense activities.

The teachers' educational background may help explain the high implementation ratings in the later tables. Teachers with graduate units may have greater exposure to research-based instruction, differentiated teaching, child-centered strategies, and classroom assessment. However, educational attainment alone does not guarantee effective implementation, as actual classroom practice also depends on available materials, training, time, class size, and teacher commitment. The result should therefore be interpreted as a supportive factor rather than a complete explanation of instructional quality.

This finding implies that teachers are well positioned to implement number-sense activities and to reflect on learners' needs. Their academic preparation can support the use of concrete materials, guided questioning, games, and assessment- based instruction. Aunio emphasized that structured early numeracy instruction benefits learners who are still developing mathematical foundations. Therefore, graduate- level exposure may help teachers design and implement activities that strengthen kindergarten numeracy skills.

**Number of Years of Teaching**

Teaching experience provides another view of the teachers' professional background. Years of teaching may shape how teachers manage learners, pace activities, identify difficulties, and adjust instruction during early mathematics lessons. Beginning and experienced teachers may contribute different strengths to classroom practice. Table 8 presents the number of years of teaching for the teachers.

Table 8. *Teachers' Number of Years of Teaching*

| Number of Years of Teaching | f | % |
|---|---|---|
| **16 and above** | 1 | 25.00 |
| **11-15** | 0 | 0.00 |
| **6-10** | 1 | 25.00 |
| **1-5** | 2 | 50.00 |
| **Total** | 4 | 100.00 |

Table 8 illustrates that two teachers (50. 50.00%) possess between 1 and 5 years of teaching experience. One educator (25. 25.00%) has between 6 and 10 years of experience, while another (25. 25.00%) has 16 or more years. No teachers fall within the 11 to 15- year experience range. The findings indicate a diverse cohort of novice and seasoned educators.

The presence of novice teachers may foster openness to innovative strategies, updated instructional materials, and interactive methodologies. Conversely, more experienced teachers are likely to contribute robust classroom routines, confidence in managing young learners, and sound judgment in lesson adaptation. This blend of experience levels can be advantageous for implementing number sense instruction, which requires both creativity and meticulous guidance. Moreover, it suggests that peer collaboration among teachers can enhance consistency across different classrooms.

This observation implies that teachers' experience should be considered when designing support mechanisms for number-sense activities. Novice teachers might benefit from mentorship programs, ready- to- use activity guides, and classroom demonstrations. Experienced educators can assist in refining instructional strategies and mentoring less experienced colleagues. According to Baron highlight that the context of activities and teacher interactions are crucial in early mathematics

teaching. The differences in teaching experience noted in this study emphasize the need for a Numeracy Skills Enhancement Plan that can be consistently adopted by educators with varying classroom experience.

**Level of Implementation of Number Sense Activities**

**Number Recognition**

Number recognition constitutes one of the foundational skills requisites for formal numeracy development. It encompasses the learner's capacity to identify written numerals and associate them with objects, quantities, and daily classroom experiences. The execution of number recognition activities serves to evaluate the consistency with which teachers support this essential skill. Table 9 delineates the extent of implementation of number sense activities concerning number recognition.

Table 9. *Level of Implementation of Number Sense Activities as Reported by the Kindergarten Teachers in Terms of Number Recognition*

| S/N | Indicators | WM | SD | Verbal Description |
|---|---|---|---|---|
| **1** | I introduce numbers using objects that learners can see and touch. | 3.75 | 0.50 | Highly Implemented |
| **2** | I connect written numerals to real-life classroom objects. | 3.50 | 0.58 | Highly Implemented |
| **3** | I give learners regular opportunities to identify numbers during daily routines. | 3.50 | 0.58 | Highly Implemented |
| **4** | I check learners' understanding of numbers before moving to new lessons. | 3.50 | 0.58 | Highly Implemented |
| **5** | I use number charts, posters, and visual aids to reinforce recognition. | 3.75 | 0.50 | Highly Implemented |
| **6** | I include number recognition games or activities during circle time. | 3.50 | 0.58 | Highly Implemented |
| **7** | I connect numbers to real-life examples outside the classroom (e.g., counting toys at home). | 3.25 | 0.50 | Highly Implemented |
| **8** | I regularly review previously taught numbers to ensure retention. | 3.50 | 0.58 | Highly Implemented |
| **9** | I encourage learners to recognize numbers in different formats (e.g., dots, tally marks). | 3.25 | 0.50 | Highly Implemented |
| **10** | I integrate number recognition in other subject areas (e.g., MAPEH, language activities). | 3.25 | 0.50 | Highly Implemented |
| | Aggregate Mean | 3.48 | | Highly Implemented |
| | Aggregate Standard Deviation | | 0.54 | |

Legend: 3.25-4.00 - Highly Implemented; 2.50-3.24 - Implemented; 1.75-2.49 - Less Implemented; 1.00-1.74 - Not Implemented

Table 9 shows that all indicators for number recognition were rated highly implemented. The highest weighted means were obtained by introducing numbers using objects that learners can see and touch and by using number charts, posters, and visual aids, both with a weighted mean of 3.75. Several indicators obtained a weighted mean of 3.50, including connecting numerals to classroom objects, giving regular opportunities to identify numbers, checking understanding before moving to new lessons, using games during circle time, and reviewing previously taught numbers. The aggregate mean of 3.48 and the aggregate standard deviation of 0.54 indicate that number recognition activities were consistently implemented across the kindergarten classes.

The results suggest that teachers placed strong emphasis on concrete and visual supports. Number recognition was not treated as simple memorization of symbols, as learners were exposed to objects, charts, games, classroom routines, and repeated review. The slightly lower indicators, which involved

connecting numbers to examples outside the classroom, recognizing numbers in different formats, and integrating number recognition across subjects, were still highly implemented. This means that number recognition was already part of classroom instruction, but it may still be expanded through cross-curricular and home-based tasks.

This finding implies that teachers recognized the need to connect written numerals with concrete experiences. Since kindergarten learners are still developing symbolic understanding, they benefit from repeated exposure to number symbols in meaningful situations. Nurmulkiah and Chamidah found that contextual learning can enhance number recognition by connecting numerals with familiar experiences. Byrne also highlighted that physical manipulatives can aid children's learning, reinforcing the idea that concrete and visual materials are beneficial in early number recognition teaching.

**Counting Skills**

Counting skills refer to the learner's ability to recite number words, count objects accurately, and connect each counted item with one number word. These skills are important because they prepare learners for comparing quantities and performing simple operations. The implementation of counting activities shows how teachers provide repeated and guided practice in early mathematics. Table 10 presents the level of implementation of number sense activities in terms of counting skills.

Table 10 shows that all counting skills indicators were rated as highly implemented. Most indicators had a weighted mean of 3.50 with a standard deviation of 0.58, including counting objects one at a time, counting aloud in groups, using songs and movements, allowing learners to demonstrate counting, counting in classroom areas, counting forward and backward, counting in pairs or small groups, connecting counting to real-life situations, and challenging learners with larger sets. The lowest weighted mean was 3.25 for monitoring learners' counting and gently correcting errors. The aggregate mean of 3.48 and aggregate standard deviation of 0.57 indicate high and generally consistent implementation of counting activities.

Table 10. *Level of Implementation of Number Sense Activities as Reported by the Kindergarten Teachers in Terms of Counting Skills*

| S/N | Indicators | WM | SD | Verbal Description |
|---|---|---|---|---|
| **1** | I guide learners to count objects one at a time without skipping. | 3.50 | 0.58 | Highly Implemented |
| **2** | I encourage learners to count aloud during group activities. | 3.50 | 0.58 | Highly Implemented |
| **3** | I use songs, games, or movements to practice counting. | 3.50 | 0.58 | Highly Implemented |
| **4** | I allow learners to demonstrate counting in their own way. | 3.50 | 0.58 | Highly Implemented |
| **5** | I encourage learners to count objects in different areas of the classroom. | 3.50 | 0.58 | Highly Implemented |
| **6** | I guide learners to count in sequence forwards and backward. | 3.50 | 0.58 | Highly Implemented |
| **7** | I provide opportunities for learners to count in pairs or small groups. | 3.50 | 0.58 | Highly Implemented |
| **8** | I monitor learners' counting to correct errors gently. | 3.25 | 0.50 | Highly Implemented |
| **9** | I connect counting to real-life situations (e.g., snack time, playground). | 3.50 | 0.58 | Highly Implemented |
| **10** | I challenge learners to count larger sets of objects as their skills improve. | 3.50 | 0.58 | Highly Implemented |
| | Aggregate Mean | 3.48 | | Highly Implemented |

| | |
|---|---|
| Aggregate Standard Deviation | 0.57 |

Legend: 3.25-4.00 - Highly Implemented; 2.50-3.24 - Implemented; 1.75-2.49 - Less Implemented; 1.00-1.74 - Not Implemented

The results show that counting was implemented through varied, active strategies rather than oral recitation alone. Learners were given opportunities to count objects, move while counting, count with classmates, count in classroom routines, and extend counting as their skills improved. The slightly lower score on gentle correction may suggest that teachers could further improve how they observe counting errors and provide immediate, supportive feedback. This is important because young learners may memorize number sequences without fully understanding one-to-one correspondence or cardinality.

This finding implies that counting instruction should continue to combine repetition, movement, objects, and teacher guidance. Counting becomes meaningful when learners connect number words with actual quantities and use counting in real situations. Aunio emphasized that early numeracy intervention supports learners at risk for mathematical learning difficulties, especially when instruction is structured. DePascale and Ramani also emphasized the importance of math games in early childhood math education, endorsing the integration of songs, games, and interactive counting activities within classroom settings.

**Number Comparison**

Number comparison requires learners to understand relationships between quantities. It includes recognizing which set has more or less, identifying bigger or smaller numbers, arranging numbers, and eventually using comparison symbols. This domain is important because it moves learners beyond naming numbers into reasoning about number relationships. Table 11 presents the implementation of number comparison activities.

Table 11. *Level of Implementation of Number Sense Activities as Reported by the Kindergarten Teachers in Terms of Number Comparison*

| S/N | Indicators | WM | SD | Verbal Description |
|---|---|---|---|---|
| **1** | I ask learners to compare groups of objects using more, less, or same. | 3.25 | 0.50 | Highly Implemented |
| **2** | I present activities where learners choose which number is bigger or smaller. | 3.50 | 0.58 | Highly Implemented |
| **3** | I use classroom materials to show differences in quantity. | 3.25 | 0.50 | Highly Implemented |
| **4** | I provide follow-up questions to explain learners' choices. | 3.25 | 0.50 | Highly Implemented |
| **5** | I ask learners to arrange numbers in ascending or descending order. | 3.25 | 0.50 | Highly Implemented |
| **6** | I use real objects (blocks, fruits, toys) to compare quantities. | 3.50 | 0.58 | Highly Implemented |
| **7** | I incorporate games where learners match numbers to sets of objects. | 3.50 | 0.58 | Highly Implemented |
| **8** | I encourage learners to explain why one number is greater or smaller than another. | 3.50 | 0.58 | Highly Implemented |
| **9** | I provide opportunities for learners to compare numbers in everyday activities. | 3.50 | 0.58 | Highly Implemented |
| **10** | I guide learners to use symbols (> , < , =) to represent comparisons. | 3.25 | 0.50 | Highly Implemented |
| | Aggregate Mean | 3.38 | | Highly Implemented |

| | |
|---|---|
| Aggregate Standard Deviation | 0.54 |

Legend: 3.25-4.00 - Highly Implemented; 2.50-3.24 - Implemented; 1.75-2.49 - Less Implemented; 1.00-1.74 - Not Implemented

Table 11 shows that all the comparison indicators received high implementation ratings. The highest weighted mean of 3.50 was obtained by activities where learners chose which number was bigger or smaller, used real objects to compare quantities, matched numbers to sets of objects, explained why one number was greater or smaller, and compared numbers in everyday activities. The indicators with a weighted mean of 3.25 involved comparing groups using more, less, or same, using classroom materials to show quantity differences, asking follow-up questions, arranging numbers in order, and using comparison symbols. The aggregate mean of 3.38 and standard deviation of 0.54 indicate high implementation, although this domain was slightly lower than other number sense components.

The result suggests that teachers implemented number comparison mostly through concrete and situational activities. Learners were exposed to real objects and classroom examples, which are appropriate for understanding more, less, same, bigger, and smaller. However, tasks involving ordered arrangement and comparison symbols may have been less emphasized because they require a higher level of abstraction. This suggests that number comparison is being taught, but it still needs more structured and progressive support from concrete comparison to symbolic representation.

This finding implies that number comparison should be strengthened because it serves as a bridge between counting and operations. Learners who can compare quantities are better prepared to understand addition, subtraction, and simple problem-solving. Ghazali described number sense as children's grasp of numbers, quantities, and their relationships. Er and Artut additionally found that number sense is linked to problem-solving strategies, highlighting the importance of enhancing learners' understanding of number relationships via comparison activities.

**Basic Operations**

Basic operations refer to learners' beginning understanding of addition and subtraction. At the kindergarten level, these concepts are best introduced through concrete objects, story situations, guided questions, and hands-on problem solving. The implementation of basic operation activities shows how teachers prepare learners for later mathematics. Table 12 presents the level of implementation of number sense activities in terms of basic operations. Table 12 shows that all indicators for basic operations were rated highly implemented. Most indicators obtained a weighted mean of 3.50 with a standard deviation of 0.58, including teaching subtraction by removing objects, allowing learners to solve problems with hands-on materials, guiding learners during problem-solving, using story problems, using manipulatives, allowing multiple ways to solve problems, assessing understanding, using group activities, and asking follow-up questions. The lowest weighted mean was 3.25 for introducing addition through sharing or combining objects. The aggregate mean of 3.48 and standard deviation of 0.57 indicate that basic operation activities were consistently implemented.

The result shows that teachers introduced addition and subtraction through concrete and guided experiences. This is appropriate because kindergarten learners usually understand operations better when they can physically combine, remove, group, or count objects. The slightly lower score for introducing addition through sharing or combining objects may suggest that subtraction and problem-solving tasks were more frequently emphasized than basic joining activities. Still, the overall result shows strong classroom exposure to early operation concepts.

Table 12. *Level of Implementation of Number Sense Activities as Reported by the Kindergarten Teachers in Terms of Basic Operations*

| S/N | Indicators | WM | SD | Verbal Description |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **1** | I introduce addition through sharing or combining objects. | 3.25 | 0.50 | Highly Implemented |
| **2** | I teach subtraction by removing objects from a group. | 3.50 | 0.58 | Highly Implemented |
| **3** | I let learners solve simple problems using hands-on materials. | 3.50 | 0.58 | Highly Implemented |
| **4** | I observe and guide learners while they solve number problems. | 3.50 | 0.58 | Highly Implemented |
| **5** | I use story problems to introduce addition and subtraction in real-life contexts. | 3.50 | 0.58 | Highly Implemented |
| **6** | I encourage learners to use manipulatives (blocks, counters) to solve addition and subtraction problems. | 3.50 | 0.58 | Highly Implemented |
| **7** | I allow learners to demonstrate multiple ways to solve a problem. | 3.50 | 0.58 | Highly Implemented |
| **8** | I assess learners' understanding before moving to more advanced operations. | 3.50 | 0.58 | Highly Implemented |
| **9** | I incorporate group activities to solve basic operation problems. | 3.50 | 0.58 | Highly Implemented |
| **10** | I provide follow-up questions to strengthen learners' problem-solving strategies. | 3.50 | 0.58 | Highly Implemented |
| | Aggregate Mean | 3.48 | | Highly Implemented |
| | Aggregate Standard Deviation | | 0.57 | |

Legend: 3.25-4.00 - Highly Implemented; 2.50-3.24 - Implemented; 1.75-2.49 - Less Implemented; 1.00-1.74 - Not Implemented

This finding implies that teachers should continue using manipulatives, story problems, and guided questioning, while ensuring that both addition and subtraction receive balanced attention. Learners need to connect operations with real actions before they can understand written number sentences. Byrne stressed that physical manipulatives help make abstract learning more concrete. Siller and Ahmad also reported that concrete and virtual manipulative blended instruction can improve mathematical achievement, supporting the importance of hands-on operation activities in early numeracy.

**Summary on the Level of Implementation of Number Sense Activities**

The summary table brings together the four domains of number sense activities. This allows comparison of which domains were implemented more strongly and which domain may need additional attention. The summary also provides an overall picture of how consistently teachers carried out number sense activities in kindergarten classrooms. Table 13 presents the summarized level of implementation.

Table 13. *Summary on the Level of Implementation of Number Sense Activities as Reported by the Kindergarten Teachers*

| Number Sense Activities | WM | SD | Verbal Description |
|---|---|---|---|
| **Number Recognition** | 3.48 | 0.54 | Highly Implemented |
| **Counting Skills** | 3.48 | 0.57 | Highly Implemented |
| **Number Comparison** | 3.38 | 0.54 | Highly Implemented |
| **Basic Operations** | 3.48 | 0.57 | Highly Implemented |
| **Grand Mean** | 3.46 | 0.56 | Highly Implemented |

Legend: 3.25-4.00 - Highly Implemented; 2.50-3.24 - Implemented; 1.75-2.49 - Less Implemented; 1.00-1.74 - Not Implemented

Table 13 shows that number recognition, counting skills, and basic operations had the same weighted mean of 3. 48. Number comparison had a slightly lower weighted mean of 3.38. 38 but remained highly implemented. The grand mean was 3. 46, with a grand standard deviation of 0. 56. This indicates that number sense activities were generally implemented at a high level across all domains.

The equal means for number recognition, counting skills, and basic operations suggest that teachers gave similar instructional attention to these areas. Number comparison, while still highly implemented, emerged as the relatively weakest domain. This may be because number comparison requires learners to understand relationships between quantities, a more demanding task than recognizing numerals or counting objects. The result therefore identifies number comparison as a possible priority area for improvement.

This finding implies that the Numeracy Skills Enhancement Plan should maintain the current high level of implementation while providing more targeted activities focused on number comparison. Such activities may include ordering games, greater- than and less- than tasks using objects, matching quantities, and guided explanations of choices. Ghazali emphasized that number sense includes numerical relationships, while De Chambrier showed that play- based numerical intervention can improve children' s numerical skills. These studies support a plan that strengthens comparison through concrete, guided, and playful activities.

**Level of Numeracy Performance of Kindergarten Learners in terms of Number Recognition**

Learners' numeracy performance in number recognition measures their ability to identify written numerals and to connect them to their meanings. This skill is necessary before learners can perform more complex numeracy tasks. The distribution across performance levels helps identify whether learners have mastered the skill or still need support. Table 14 presents learners' numeracy performance in number recognition.

Table 14. *Level of Numeracy Performance of Kindergarten Learners in Terms of Number Recognition*

| Level | Range of Scores | f | % |
|---|---|---|---|
| **Advanced** | 10 | 89 | 55.63 |
| **Proficient** | 7-9 | 61 | 38.13 |
| **Intermediate** | 4-6 | 10 | 6.25 |
| **Beginner** | 0-3 | 0 | 0.00 |
| **Total** | | 160 | 100.00 |

Table 14 shows that 89 learners, or 55.63 percent, were at the advanced level in number recognition. Another 61 learners, or 38.13 percent, were at the proficient level, while 10 learners, or 6.25 percent, were at the intermediate level. No learner was classified under the beginner level. These results indicate that most kindergarten learners demonstrated strong performance in recognizing numbers.

The combined percentage of advanced and proficient learners reached 93.76 percent, showing that number recognition was already well-developed among most respondents. This result is consistent with the high implementation rating for number recognition activities in Table 9. The presence of 10 intermediate learners, however, shows that a small group still needs reinforcement. These learners may require additional exposure to number cards, objects, visual symbols, matching tasks, and daily review.

This finding implies that number recognition activities should be maintained while adding targeted support for learners who have not yet reached proficiency. Since number recognition is a prerequisite for counting, comparison, and operations, gaps in this domain may affect later skills. Nurmulkiah and Chamidah emphasized that contextual learning supports number recognition, especially when numbers are connected with familiar materials and situations. Kirkland [27] also highlighted the

importance of assessing mature number sense, supporting the need to identify learners who need focused intervention.

**Counting Skills**

Counting skills measure learners' ability to count objects accurately, follow number sequence, and connect number words with quantities. This skill is central to early numeracy because it supports number comparison and simple operations. The results help determine whether classroom counting activities are reflected in learners' actual performance. Table 15 presents the learners' numeracy performance in terms of counting skills.

Table 15 shows that 81 learners, or 50.63 percent, were at the advanced level in counting skills. There were 66 learners, or 41.25 percent, at the proficient level, and 13 learners, or 8.13 percent, at the intermediate level. No learner was classified under the beginner level. Overall, most learners showed strong counting performance

Table 15. *Level of Numeracy Performance of Kindergarten Learners in Terms of Counting Skills*

| Level | Range of Scores | f | % |
|---|---|---|---|
| **Advanced** | 10 | 81 | 50.63 |
| **Proficient** | 7-9 | 66 | 41.25 |
| **Intermediate** | 4-6 | 13 | 8.13 |
| **Beginner** | 0-3 | 0 | 0.00 |
| **Total** | | 160 | 100.00 |

The combined advanced and proficient percentage was 91.88 percent, indicating that most learners were able to perform counting-related tasks successfully. This result is aligned with the high implementation of counting skills activities reported by the teachers. However, the 13 intermediate learners suggest that some children may still experience difficulty in one-to-one correspondence, forward and backward counting, or counting larger sets. These specific areas should be considered when designing follow-up activities.

This finding implies that counting activities should remain interactive, repetitive, and concrete. Counting should be practiced not only through recitation but also through touching, moving, grouping, and counting actual objects. Aunio emphasized the value of structured early numeracy intervention for young learners. DePascale and Ramani also discovered that math games enhance children's early mathematical development, reinforcing the inclusion of counting games, songs, movement, and guided practice in the suggested plan.

**Number Comparison**

Number comparison measures learners' ability to understand relationships between quantities and numbers. This includes identifying more, less, equal, bigger, smaller, and proper ordering. Compared with number recognition and counting, comparison requires more reasoning because learners must analyze relationships rather than simply name or count numbers. Table 16 presents the learners' numeracy performance in number comparison.

Table 16. *Level of Numeracy Performance of Kindergarten Learners in Terms of Number Comparison*

| Level | Range of Scores | f | % |
|---|---|---|---|
| **Advanced** | 10 | 63 | 39.38 |
| **Proficient** | 7-9 | 75 | 46.88 |
| **Intermediate** | 4-6 | 22 | 13.75 |
| **Beginner** | 0-3 | 0 | 0.00 |
| **Total** | | 160 | 100.00 |

Table 16 indicates that 75 learners, or 46.88 percent, achieved the proficient level in number comparison. Additionally, 63 learners, or 39.38 percent, reached the advanced level, while 22 learners, or 13.75 percent, were at the intermediate level. No learners were categorized as beginners. Although most learners performed well, number comparison had fewer advanced learners and more intermediate learners than number recognition and counting skills.

The result suggests that number comparison is a more challenging domain for kindergarten learners. Learners may be able to recognize and count numbers, but comparing quantities requires them to judge relationships, identify differences, and sometimes explain why one set is greater or smaller. The higher intermediate percentage indicates that some learners still need repeated practice in comparing objects, arranging numbers, and using relational language. This also connects with Table 13, where number comparison had the lowest implementation mean among the four number sense domains.

This finding implies that number comparison should be given stronger attention in the enhancement plan. Activities should begin with concrete comparisons using blocks, toys, fruits, counters, and other familiar objects before moving to visual and symbolic tasks. Ghazali explained that number sense involves children's understanding of numerical relationships. Er and Artut also emphasized the connection between number sense and problem-solving strategies, supporting the need to strengthen comparison as a foundation for reasoning and operations.

**Basic Operations**

Basic operations assess learners' ability to perform simple addition and subtraction tasks. At the kindergarten level, these tasks usually involve combining objects, removing objects, counting fingers, or solving story-based problems. This domain shows whether learners can use number recognition and counting in simple problem situations. Table 17 presents the learners' numeracy performance in basic operations.

Table 17. *Level of Numeracy Performance of Kindergarten Learners in Terms of Basic Operations*

| Level | Range of Scores | f | % |
|---|---|---|---|
| **Advanced** | 10 | 62 | 38.75 |
| **Proficient** | 7-9 | 92 | 57.50 |
| **Intermediate** | 4-6 | 6 | 3.75 |
| **Beginner** | 0-3 | 0 | 0.00 |
| **Total** | | 160 | 100.00 |

Table 17 shows that 92 learners, or 57.50 percent, were at the proficient level in basic operations. There were 62 learners, or 38.75 percent, at the advanced level, while only 6, or 3.75 percent, were at the intermediate level. No learner was classified under the beginner level. These results indicate that most kindergarten learners were able to perform simple operation tasks at a functional level.

The larger percentage of proficient learners suggests that many respondents could solve simple addition and subtraction tasks but may still need support to reach full mastery. The very small intermediate group shows that only a few learners had difficulty with this domain. Compared with number comparison, basic operations showed fewer learners in the intermediate level, possibly because operation tasks were supported by concrete materials, fingers, and familiar story situations. This suggests that concrete support may have helped learners understand putting together and taking away.

This finding implies that the use of manipulatives and story problems should be continued in basic operation instruction. Learners at the proficient level may be challenged with more varied yet developmentally appropriate tasks, while the intermediate group should receive guided practice with objects and visual cues. Byrne highlighted the benefit of physical manipulatives in improving

children's learning. Similarly, Siller and Ahmad endorsed manipulative-based instruction, reinforcing the suggestion to include hands-on basic operation activities in the improvement plan.

**Test of Relationship Between the Learners' Profile and their Numeracy Performance**

The relationship test assesses whether chosen learner profile variables are linked to numeracy performance. The variables analyzed include age, gender, parents' educational level, number of siblings, and total family monthly income. A chi-square test was applied to determine if the differences in numeracy performance across these categories are statistically significant. Table 18 shows the test results.

Table 18 shows that only age had a significant relationship with numeracy performance, with a chi-square value of 7.938, df = 2, and p = 0.019. Since the p-value was lower than 0.05, the null hypothesis was rejected for age. This means that age was statistically associated with learners' numeracy performance. In contrast, gender, mother's highest educational attainment, father's highest educational attainment, number of siblings, and income all had p-values greater than 0.05, so the null hypothesis was not rejected for these variables.

Table 18. *Test of Relationship Between the Learners' Profile and their Numeracy Performance*

| Variables | Chi-square value | df | p-value | Decision | Remarks |
|---|---|---|---|---|---|
| **Age and Numeracy Performance** | 7.938 | 2 | 0.019 | Reject H0 | Significant |
| **Gender and Numeracy Performance** | 2.329 | 2 | 0.312 | Do not reject H0 | Not Significant |
| **Mother's Highest Educational Attainment and Numeracy Performance** | 6.975 | 6 | 0.323 | Do not reject H0 | Not Significant |
| **Father's Highest Educational Attainment and Numeracy Performance** | 7.163 | 8 | 0.519 | Do not reject H0 | Not Significant |
| **Number of Siblings and Numeracy Performance** | 5.653 | 6 | 0.463 | Do not reject H0 | Not Significant |
| **Income and Numeracy Performance** | 12.431 | 10 | 0.257 | Do not reject H0 | Not Significant |

*Significant at $p < 0.05$

For age, the significant result suggests that developmental readiness may affect performance in number recognition, counting skills, number comparison, and basic operations. Older kindergarten learners may have better attention span, stronger language comprehension, greater task persistence, and more developed working memory than younger learners. These abilities can help them follow instructions, compare quantities, remember number sequences, and solve simple problems. Braak support this finding by showing that early mathematics skills are connected to executive function, while Visibelli [28] reviewed developmental markers of numerical abilities in early childhood.

For gender, the result was not significant, with p = 0.312. This indicates that male and female learners had comparable numeracy performance in this study. The finding suggests that number sense activities may have provided similar learning opportunities for both groups. This result is consistent with the direction of the RRL, which places greater emphasis on instruction, manipulatives, games, and teacher support than on gender as the main determinant of early mathematics performance. Hui and Mahmud noted that game-based learning influences both the cognitive and emotional facets of students. Meanwhile, Byrne highlighted the importance of manipulatives in children's learning, indicating that instructional exposure might be more significant than gender differences in this setting.

For mothers' highest educational attainment, the result was not significant, with p = 0.323. This means that the learners' numeracy performance did not differ significantly according to mothers' educational attainment. This finding differs from studies that emphasize the role of home learning support, as mothers' education may influence their confidence in guiding children at home. However, the present result may be explained by the strong school-based implementation of number sense activities, which may have provided common learning experiences regardless of maternal educational background. Young emphasized the value of family math activities, but the current finding suggests that classroom instruction may help reduce differences linked to home background.

For fathers' highest educational attainment, the result was also not significant, with p = 0.519. This indicates that father's educational background was not statistically associated with learners' numeracy performance. The finding may differ from expectations that parental education contributes to children's learning because early numeracy support at home can vary with parent involvement, time availability, and family routines, not only with educational attainment. In the present study, learners may have received enough structured classroom exposure to lessen the influence of differences in fathers' education. This interpretation is related to De Chambrier, who showed that structured play-based intervention in kindergarten and at home can support numerical skills.

For the number of siblings, the result was not significant, with p = 0.463. This means that the number of siblings was not statistically related to numeracy performance. The finding suggests that learners with no siblings, few siblings, or several siblings performed in generally comparable ways. Although family size may affect attention and resources at home, it may also create opportunities for shared play, informal counting, and interaction among children. This result partially differs from the assumption that fewer siblings automatically mean stronger academic support, since number sense activities can also be practiced with siblings through games, sorting, comparing, and counting tasks.

The family's income level did not significantly affect numeracy performance, with a p-value of 0.257, indicating no meaningful correlation in this study. This finding may differ from the literature that links socioeconomic conditions to access to learning resources, but it may be explained using school-based, low-cost number-sense activities. Learners from lower-income homes may still perform well when instruction uses accessible materials and consistent guided practice. Byrne support this interpretation, noting that physical manipulatives need not be expensive to support learning, while Young show that home-school math connections can strengthen early mathematics learning.

## CHAPTER 4

## RESULT AND DISCUSSION

This chapter provides a summary of the study, highlights the key findings from the data, presents the conclusions, and offers recommendations based on the results.

This study assessed the numeracy performance of kindergarten learners who were exposed to number-sense activities at Tabok Elementary School 1 in the Mandaue City Division during the School Year 2025–2026. Specifically, it determined the learners' profiles in terms of age and gender, parents' highest educational attainment, number of siblings, and combined family monthly income. It also determined the profile of the kindergarten teachers in terms of age and gender, highest educational attainment, and years of teaching experience. Further, the study assessed the level of implementation of number sense activities in terms of number recognition, counting skills, number comparison, and basic operations; determined the level of numeracy performance of kindergarten learners in the same domains; tested the relationship between the learners' profile and their numeracy performance; and proposed a Numeracy Skills Enhancement Plan based on the findings.

The study employed a descriptive-correlational research design. This methodology was deemed appropriate as it facilitated the characterization of respondent groups, the execution of number sense

activities, and the assessment of learners' numeracy performance. Additionally, it aimed to establish whether a significant relationship existed between the learners' profiles and their numeracy outcomes.

The study's respondents were the parents of kindergarten learners and the kindergarten teachers at Tabok Elementary School 1. The parents provided the needed data on the learners' profile and family background, while the kindergarten teachers provided data on the implementation of number sense activities. The numeracy performance data of the kindergarten learners were obtained through the assessment tool administered for the study.

The study used purposive sampling in selecting the respondent groups. This sampling technique was used because the selected parents and teachers were directly connected to the kindergarten learners involved in the study and could provide the data needed to address the research problems.

The study used a four-part research instrument. Part I gathered the profile of the learners. Part II gathered the profile of the kindergarten teachers. Part III assessed the level of implementation of number sense activities across number recognition, counting skills, number comparison, and basic operations. Part IV assessed the numeracy performance of kindergarten learners in the same four domains.

The data gathered were analyzed using frequency counts, percentages, weighted means, standard deviations, and the Chi-square test. Frequency counts and percentages were used to describe the profiles of the learners and teachers. Weighted mean and standard deviation were used to determine the level of implementation of number sense activities and the level of numeracy performance. The Chi-square test was used to determine the significance of the relationship between learners' profiles and their numeracy performance.

## CHAPTER 5

## OUTPUT OF THE STUDY

### NUM-SENSE: A Kindergarten Number Sense Training Program for Strengthening Early Numeracy Skills

This chapter introduces the proposed output of the study: a Number Sense Enhancement Plan aimed at improving kindergarten learners' numeracy skills. It is developed based on the study's findings and emphasizes enhancing students' abilities in number recognition, counting, comparison, and fundamental operations.

### Rationale

Early numeracy is an important foundation for later mathematical learning. Kindergarten learners need repeated exposure to numbers through concrete, playful, visual, and guided activities. In the present study, the implementation of number sense activities was rated Highly Implemented, with a grand mean of 3.46. Learners also performed well in number recognition, counting skills, and basic operations. However, number comparison had the lowest percentage of learners at the Advanced level and the highest at the Intermediate level.

These findings show the need for a focused training program that will help teachers strengthen the delivery of number sense activities, especially in number comparison. The proposed training program will equip kindergarten teachers with practical strategies, sample activities, assessment tools, and low-cost materials for daily classroom instruction. The program is designed to be simple, developmentally appropriate, and suited to the learning needs of kindergarten learners.

### Objectives

The general objective of the Number Sense Training Program is to enhance kindergarten teachers' capacity to implement developmentally appropriate number-sense activities that improve learners' numeracy performance.

Specifically, the training program aims to:

1. Improve teachers' understanding of number sense as a foundation of early numeracy.
2. Strengthen teachers' skills in teaching number recognition, counting skills, number comparison, and basic operations.
3. Provide teachers with practical and low-cost activities for kindergarten numeracy instruction.
4. Equip teachers with strategies for addressing learners who are at the Intermediate level.
5. Promote the use of play-based, hands-on, and guided learning activities in teaching early mathematics.
6. Develop classroom-based action plans that can be implemented after the training.

**Scheme of Implementation**

The implementation of the NUM-SENSE Program will be carried out in five structured phases to ensure its effective delivery and sustainability. The first phase, pre-implementation, involves planning and preparation activities such as coordination meetings, participant identification, training materials preparation, and program activity scheduling. This is followed by the Training Implementation phase, in which a structured training program is conducted, focusing on number sense concepts, instructional strategies, and classroom applications through workshops, demonstrations, and collaborative learning activities. In the third phase, Classroom Application, teachers apply the learned strategies in their daily instruction using manipulatives, games, guided activities, and differentiated teaching approaches. The fourth phase, Monitoring and Evaluation, involves regular supervision by school administrators to assess program implementation, provide instructional feedback, and evaluate learners' numeracy progress. Finally, the Sustainability Plan ensures continuous improvement by developing classroom-based action plans, supported by ongoing coaching, mentoring, and follow-up activities to sustain the program's gains.

**NUMERACY SKILLS ENHANCEMENT PLAN MATRIX**

| Areas of Concern | Objectives | Strategies/Activities | Persons Involved | Budget (₱) | Source of Budget | Time Frame (Inclusive Month and Year) | Expected Outcomes | Actual Accomplishment | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| **Teacher Competency in Number Sense Instruction** | Improve teachers' understanding of number sense as a foundation of early numeracy | Conduct orientation and training sessions on the concept and importance of number sense in early childhood education | School Head, Master Teachers, Kindergarten Teachers | ₱2,000 | School MOOE | June to August 2025 | Teachers explain the importance of number sense in kindergarten learning | Orientation and training sessions were conducted, and teachers showed improved knowledge and awareness of number sense instruction strategies | Pre-service or early school year |
| **Instructional Skills in Early Numeracy** | Strengthen teachers' skills in teaching number recognition, counting skills, number comparison, and basic operations | Provide hands-on training workshops with sample lessons, demonstrations, and classroom simulations | Kindergarten Teachers, Master Teachers | ₱3,000 | School MOOE | September to November 2025 | Teachers effectively apply varied instructional strategies in teaching early numeracy skills | Teachers participated in workshops and successfully applied demonstration lessons and classroom simulations in daily teaching | For monitoring |
| **Availability of Instructional Materials and Learning Activities** | Provide teachers with practical and low-cost activities for kindergarten | Develop and distribute activity guides, worksheets, and manipulatives using locally available materials | Kindergarten Teachers, School Head | ₱1,000 | School MOOE | June to December 2025 | Teachers and learners utilize contextualized and engaging instructional materials | Activity guides, worksheets, and improvised manipulatives were developed and utilized in classroom | Continuous |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | numeracy instruction | | | | | | during numeracy activities | numeracy activities | |
| **Learners with Low Numeracy Performance** | Equip teachers with strategies for addressing learners who are at the Intermediate level | Conduct training on remediation strategies, differentiated instruction, and small-group interventions | Kindergarten Teachers, Parents | ₱2,000 | School MOOE | July to December 2025 | Learners at the Intermediate level show improvement in numeracy performance through remediation activities | Remediation sessions and differentiated activities were conducted, resulting in improved learner participation and performance | Monitor Progress |
| **Teaching and Learning Approaches in Numeracy** | Promote the use of play-based, hands-on, and guided learning activities in teaching early mathematics | Integrate games, manipulatives, storytelling, and activity-based learning strategies in lesson plans | Kindergarten Teachers | ₱2,500 | School Fund | June 2025 to March 2026 | Learners become more engaged and active during numeracy lessons and demonstrate improved numeracy skills | Play-based and activity-centered approaches were integrated into lessons, increasing learner engagement and participation in numeracy activities | For monitoring |
| **Sustainability and Implementation of Numeracy Strategies** | Develop classroom-based action plans that can be implemented after the training | Require teachers to design and implement numeracy action plans with monitoring and coaching support | Kindergarten Teachers, School Head | No additional cost (planning output only) | School PTA/LGU Fund | November to December 2025 | Teachers develop and consistently implement classroom-based numeracy action plans with continuous monitoring and support | Teachers prepared and implemented numeracy action plans; monitoring and coaching sessions were conducted to ensure sustainability of strategies | Strengthened support from the LGU/stakeholders |

## Findings

Most of the kindergarten students were within the typical age range, with a higher number of male learners than female learners. Most mothers and fathers of the learners were high school graduates. Most learners had one to two siblings, and many belonged to families with low combined monthly income. The kindergarten teacher-respondents were all female. Most had earned units in the master's program, while the rest had completed a bachelor's degree. In terms of teaching experience, the teachers had varied lengths of service. The level of implementation of number sense activities was highly implemented in all four domains: number recognition, counting skills, number comparison, and basic operations. Among the four domains of number sense activities, number comparison obtained the lowest level of implementation, although it was still described as highly implemented. The kindergarten learners showed strong numeracy performance in number recognition. The kindergarten learners showed strong numeracy performance in counting skills. The kindergarten learners showed generally strong numeracy performance in number comparison, although this domain had more learners who still needed reinforcement compared with the other domains. The kindergarten learners showed strong numeracy performance in basic operations. Among the four numeracy domains, number comparison appeared to be the area needing the most instructional support. Age was significantly related to the numeracy performance of kindergarten learners. Gender, parents' highest educational attainment, number of siblings, and combined family monthly income were not significantly related to the numeracy performance of kindergarten learners. Based on the findings, a Numeracy Skills Enhancement Plan was proposed to strengthen kindergarten learners' numeracy performance, particularly in number comparison.

## Conclusions and Recommendations

The kindergarten learners in the study were mostly within the appropriate developmental stage for early numeracy learning, generally aged 5 to 6 years, with a slightly higher number of males, which

did not significantly affect the sample balance. Most learners came from families in which parents had reached a high school level of education, had one to two siblings, and belonged to lower-income households, indicating the important role of school-based instruction in supporting early numeracy development. The kindergarten teachers were professionally qualified, with most having earned master's units and possessing varied teaching experience, which supported the effective implementation of number sense activities in the classroom. Overall, number sense activities were highly implemented across all domains, including number recognition, counting skills, number comparison, and basic operations, showing consistent use of hands-on and guided strategies. Learners generally demonstrated strong numeracy performance, particularly in number recognition, counting, and basic operations; however, number comparison emerged as the weakest domain. Statistical results revealed that age was significantly related to numeracy performance, while gender, parental education, number of siblings, and family income were not. Based on these findings, the enhancement plan prioritizes strengthening number comparison skills through activities focused on comparing quantities, ordering numbers, and understanding numerical relationships.

Based on the study's findings and conclusions, the following recommendations are proposed:

Kindergarten teachers should sustain the use of number sense activities in teaching number recognition, counting skills, number comparison, and basic operations. These activities should continue to use concrete objects, visual aids, games, d comparing groups of objects using manipulatives and daily classroom materials. Teachers should provide differentiated activities based on learners' age and developmental readiness. Younger learners may be given more concrete, repetitive, and guided activities, while learners who are more ready may be given more challenging comparison and basic operation tasks. School administrators should support kindergarten teachers by providing instructional materials for number sense activities, such as counters, number cards, blocks, charts, visual aids, and other low-cost manipulatives. They may also conduct monitoring and provide mentoring to ensure that number-sense activities are consistently implemented. Parents and guardians should be encouraged to support numeracy development at home through simple and practical activities. These may include counting household objects, comparing quantities during meals or play, identifying numbers in the environment, and using toys or available materials for simple addition and subtraction. The proposed Numeracy Skills Enhancement Plan should be implemented to strengthen kindergarten learners' numeracy performance, particularly in number comparison. The plan should include classroom-based and home-based activities that are simple, low-cost, developmentally appropriate, and aligned with the learners' needs. Future researchers might perform similar studies with more schools, participants, or divisions to verify these results. They could also examine additional factors affecting numeracy performance, like teaching methods, home learning environments, student engagement, attendance rates, and availability of learning resources.

## BIBLIOGRAPHY


[1] M. G. Almulhim and T. Fujita, "The enhancement of number sense through the interactive reading of mathematical stories in kindergarten," *Education Sciences*, vol. 16, no. 2, Art. no. 296, 2026.

[2] E. M. Byrne, H. Jensen, B. S. Thomsen, and P. G. Ramchandani, "Educational interventions involving physical manipulatives for improving children's learning and development: A scoping review," *Review of Education*, vol. 11, no. 2, Art. no. e3391, 2023.

[3] M. DePascale and G. B. Ramani, "The role of math games for children's early math learning: A systematic review," *Journal of Numerical Cognition*, vol. 11, 2025.

[4] S. Sabasaje and R. Oco, "Students' mathematical skills and performance," *ResearchGate*, 2023.

[5] O. Onoshakpokaiye, "Early childhood mathematics: An insight into strategies for developing young children mathematical skills," *Mathematics Education Journal*, vol. 7, no. 1, pp. 16–30, 2023.

[6] A. De Chambrier, A. Baye, M. Tinnes-Vigne, Y. Tazouti, J. Vlassis, D. Poncelet, and C. Dierendonck, "Enhancing children's numerical skills through a play-based intervention at kindergarten and at home: A quasi-experimental study," *Early Childhood Research Quarterly*, vol. 54, pp. 164–178, 2020.

[7] A. Tayaban, "Exploring challenges in numeracy skills of kindergarten learners in Ifugao, Philippines," *Research Square*, 2025.

[8] M. Adawurah, "Enhancing early numeracy through play-based learning: A case study using counting games and visual aids in a Ghanaian kindergarten classroom," *Research Square*, 2025.

[9] Republic of the Philippines, "Republic Act No. 10157: Kindergarten Education Act," 2012.

[10] Republic of the Philippines, "Republic Act No. 10533: Enhanced Basic Education Act of 2013," 2013.

[11] Department of Education, Philippines, "DepEd Order No. 47, s. 2016: Omnibus policy on kindergarten education," 2016.

[12] M. Ghazali, R. Mohamed, and Z. Mustafa, "A systematic review on the definition of children's number sense in the primary school years," *Eurasia Journal of Mathematics, Science and Technology Education*, vol. 17, no. 6, Art. no. em1968, 2021.

[13] F. Nurmulkiah and A. N. Chamidah, "Enhancing number recognition through contextual learning," *Journal of Innovation and Research in Primary Education*, vol. 4, no. 3, pp. 1826–1837, 2025.

[14] S. S. Akther, S. R. Powell, and D. O. Lariviere, "Counting-focused intervention effects for students with mathematics difficulty: A research synthesis," *Learning Disabilities Research and Practice*, vol. 40, no. 3, pp. 162–180, 2025.

[15] Z. Er and P. D. Artut, "Comparative analysis of number sense performance and problem-solving strategies in gifted and typically developing students," *Humanities and Social Sciences Communications*, vol. 12, no. 1, 2025.

[16] F. Baron, A. Linberg, D. Dornheim, and S. Lehrl, "Improving global and math-specific teacher-toddler interactions through an intervention for early childcare teachers: The role of activity settings," *Early Childhood Research Quarterly*, vol. 70, pp. 79–90, 2024.

[17] E. Soto-Calvo, F. R. Simmons, A. M. Adams, H. N. Francis, H. Patel, and D. Giofrè, "Identifying the preschool home learning experiences that predict early number skills: Evidence from a longitudinal study," 2021.

[18] J. M. Young, K. E. Reed, H. Rosenberg, and J. F. Kook, "Adding family math to the equation: Promoting Head Start preschoolers' mathematics learning at home and school," *Early Childhood Research Quarterly*, vol. 63, pp. 43–58, 2022.

[19] J. Sarama and D. H. Clements, "'Concrete' computer manipulatives in mathematics education," *Child Development Perspectives*, vol. 3, no. 3, pp. 145–150, 2009.

[20] P. Aunio, J. Korhonen, L. Ragpot, M. Törmänen, and E. Henning, "An early numeracy intervention for first-graders at risk for mathematical learning difficulties," *Early Childhood Research Quarterly*, vol. 55, pp. 252–262, 2020.

[21] D. T. Braak, R. Lenes, D. J. Purpura, S. A. Schmitt, and I. Størksen, "Why do early mathematics skills predict later mathematics and reading achievement? The role of executive function," *Journal of Experimental Child Psychology*, vol. 214, Art. no. 105306, 2021.

[22] H. B. Hui and M. S. Mahmud, "Influence of game-based learning in mathematics education on the students' cognitive and affective domain: A systematic review," *Frontiers in Psychology*, vol. 14, Art. no. 1105806, 2023.

[23] H. Siller and S. Ahmad, "The effect of concrete and virtual manipulative blended instruction on mathematical achievement for elementary school students," *Canadian Journal of Science, Mathematics and Technology Education*, vol. 24, no. 2, pp. 229–266, 2024.

[24] M. E. Foster, "Evaluating the impact of supplemental computer-assisted math instruction in elementary school: A conceptual replication," *Journal of Research on Educational Effectiveness*, vol. 17, no. 1, pp. 94–118, 2024.

[25] G. B. Ramani and R. S. Siegler, "Promoting broad and stable improvements in low-income children's numerical knowledge through playing number board games," *Child Development*, vol. 79, no. 2, pp. 375–394, 2008.

[26] M. S. B. Dmti, "The five counting principles," *Math Success by DMTI*, Apr. 1, 2025; National Association for the Education of Young Children (NAEYC), "DAP: Defining developmentally appropriate practice," 2025; *Simply Psychology*, "Vygotsky's sociocultural theory of cognitive development," Oct. 16, 2025.

[27] P. K. Kirkland, C. Guang, C. Otuonye, and N. M. McNeil, "A brief, multiple-choice assessment of mature number sense is strongly correlated with more resource-intensive measures," *Journal of Numerical Cognition*, vol. 10, 2024.

[28] E. Visibelli, A. Porru, D. Lucangeli, B. Butterworth, and S. Benavides-Varela, "Neural indicators of numerical abilities in the infant human brain: A systematic review," *Developmental Review*, vol. 74, Art. no. 101150, 2024.