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Home Learning and Preschool Numeracy

Kimberly Dawn L. Go, Kaitlin Marie Opingo, Helen Revalde, Raymond Espina, Emerson Peteros, Dennis Plando, Irene Mamites
CEBU TECHNOLOGICAL UNIVERSITY, Main Campus, R. Palma St., Cebu City

Abstract. *This study investigated the correlation between home numeracy experiences and numeracy skills development of 44 preschoolers enrolled at the Leyte Normal University Integrated Laboratory School (LNU-ILS) in School Year 2024-2025. Data on the preschoolers' level of exposure to home numeracy experiences were collected from 44 parent-respondents using a Likert-type survey questionnaire which rated their exposure level as very high, high, or low. The level of the kindergarten pupils' numeracy skills was determined by the kindergarten teacher-in-charge through the use of the Kindergarten Numeracy Checklist developed by the Department of Education. The study sought to identify specific home numeracy practices that significantly impact preschoolers' numeracy skills, with the ultimate goal of developing an intervention plan to enhance numeracy learning both at home and in the classroom. The results of the study showed that at least four-fifths of the preschoolers in the study were already at the Advanced Level. While this is noteworthy, the task of bringing up the rest from the Intermediate and Beginner levels remains. The preschoolers surveyed had a generally high level of exposure to home numeracy experiences. They had very high exposure to numeracy skills, high exposure to number books, but low exposure to both games and application, indicating that the level of exposure to the last two components could still be improved. A statistical test for correlation indicated a significant relationship between the preschoolers' exposure to home numeracy experiences and their numeracy skills. On the basis of the above-mentioned findings, this researcher has proposed a numeracy skills strategic intervention plan -- it is a master plan that schools can adapt according to their specific needs to further enhance the numeracy skills development of their preschoolers.*

Key words: *Cognitive linguistics, Generative grammar, Structuralism, Discourse analysis, Corpus linguistics, modern linguistics, Pragmatics.*

Chapter 1

THE PROBLEM AND ITS SCOPE

Rationale

Numeracy skills are fundamental competencies that every learner needs to acquire at an early age. These skills, which include the ability to understand and work with numbers, are essential not only for academic success but also for navigating daily life. Numeracy is more than just the ability to add, subtract, multiply, divide and use numbers. Numeracy encompasses the ability to use mathematical understanding and skills to solve problems and meet the demands of day-to-day living in complex social settings. To have this ability, a young person needs to be able to think and communicate quantitatively, to make sense of data, to have a spatial awareness, to understand patterns and sequences, and to recognize situations where mathematical reasoning can be applied to solve problems.

Numeracy is a skill applied in various real-life situations. It equips individuals with the critical thinking abilities needed to solve problems, make informed decisions, and engage meaningfully with the world around them.

Despite the evident importance of numeracy, many learners face significant difficulties in mastering basic numeracy skills. Various factors contribute to this, including limited exposure to numeracy-focused activities and environments, lack of instructional reinforcement, and the challenge of bridging the gap between formal schooling and real-world application. Research consistently shows that students who do not develop strong numeracy skills early in life are likely to struggle with more complex mathematical concepts later on. Growth in kindergarteners' math skills is important for setting their developmental trajectories in elementary and middle school (Jordan, Kaplan, Ramineni, & Locuniak, 2009). For example, growth in math skills during the kindergarten year predicts math performance at the end of 1st grade (Jordan, Kaplan, Olah, & Locuniak, 2006) and 5th grade (Claessens, Duncan, & Engel, 2009). Moreover, growth in math skills from preschool to first grade is a stronger predictor of adolescent math achievement than preschool math skills alone (Watts, Duncan, Siegler, & Davis-Kean, 2014).

However, it is crucial to recognize that children's numeracy skills can be enhanced when the instruction they receive at school is supported and reinforced at home. When parents actively participate in nurturing their child's numeracy skills, they provide additional opportunities for learning and reinforcement, fostering a stronger foundation for academic success.

Children's math proficiency levels at kindergarten entry vary substantially. While 95% of children master basic math skills at kindergarten entry such as one-to-one counting of 10 objects, identifying someone-digit numerals, and recognizing some geometric shapes, only 58% can count beyond 10, read all one-digit numerals, and recognize a sequence of patterns. Only 23% can recognize the next number in a sequence, read two-digit numerals, solve simple word problems, and identify the ordinal position of an object. Only 4% master more advanced math skills such as solving addition and subtraction problems (Engel, Claessens, & Finch, 2013). The need to develop numeracy skills at an early age has become even more pressing in light of recent findings that students perform poorly in international assessments of mathematics, such as the Trends in International Mathematics and Science Study (TIMSS). "The Philippines scored 297 in Math and 249 in Science, according to the Trends in International Mathematics and Science Study (TIMSS) 2019 by the International Association for the Evaluation of Educational Achievement (IEA). Both scores are lower than how the country fared in 2003, which are 358 in Math and 332 in Science, based on the study. Meanwhile, neighboring country Singapore topped both assessments, getting a score of 625 in Math and 595 in Science." The TIMSS report underscores the need for a focused and comprehensive approach to developing numeracy skills from the earliest stages of schooling.

Given these challenges, it is essential to assess the home numeracy experiences of preschoolers and their developing numeracy skills. Initial seeds for mathematics literacy are planted during the early childhood period. Those seeds, if nurtured appropriately, can turn into strong roots for children. Children benefit when they are exposed to and provided with opportunities for math experiences that emphasize their holistic development and not just mathematics proficiency in isolation (NAEYC, 2020). These early experiences are critical in shaping a child's understanding of numbers and mathematical concepts. By understanding how home environments contribute to numeracy development, educators and policymakers can create more targeted interventions to support early learning.

In the research environments within which this study is situated, teachers have observed that a moderate number of learners exhibit poor numeracy skills. Situations such as students struggling to grasp basic counting concepts, having difficulty with simple arithmetic operations, or being unable to recognize numerical patterns have been common in classrooms. This reflects a larger concern that requires attention to both classroom instruction and the external factors influencing numeracy development, including home environments.

The primary objective of this research was to explore the relationship between preschoolers' home numeracy experiences and their numeracy skills development. By understanding these dynamics, the study aimed to propose an intervention plan for enhancing numeracy learning both in the classroom and at home. The findings are deemed valuable to stakeholders, including teachers, parents, and policymakers, as they will inform practices that can better support numeracy development in young learners. Thus, this research hopes to contribute to improving students' performance in mathematics, ensuring they are better prepared for future academic and life challenges.

Theoretical Background

This study is anchored on the following theories: Lev Vygotsky's Zone of Proximal Development (ZPD), Jean Piaget's Cognitive Development Theory, and The Home Numeracy Model (HNM) (LeFevre et al., 2010). This study is also

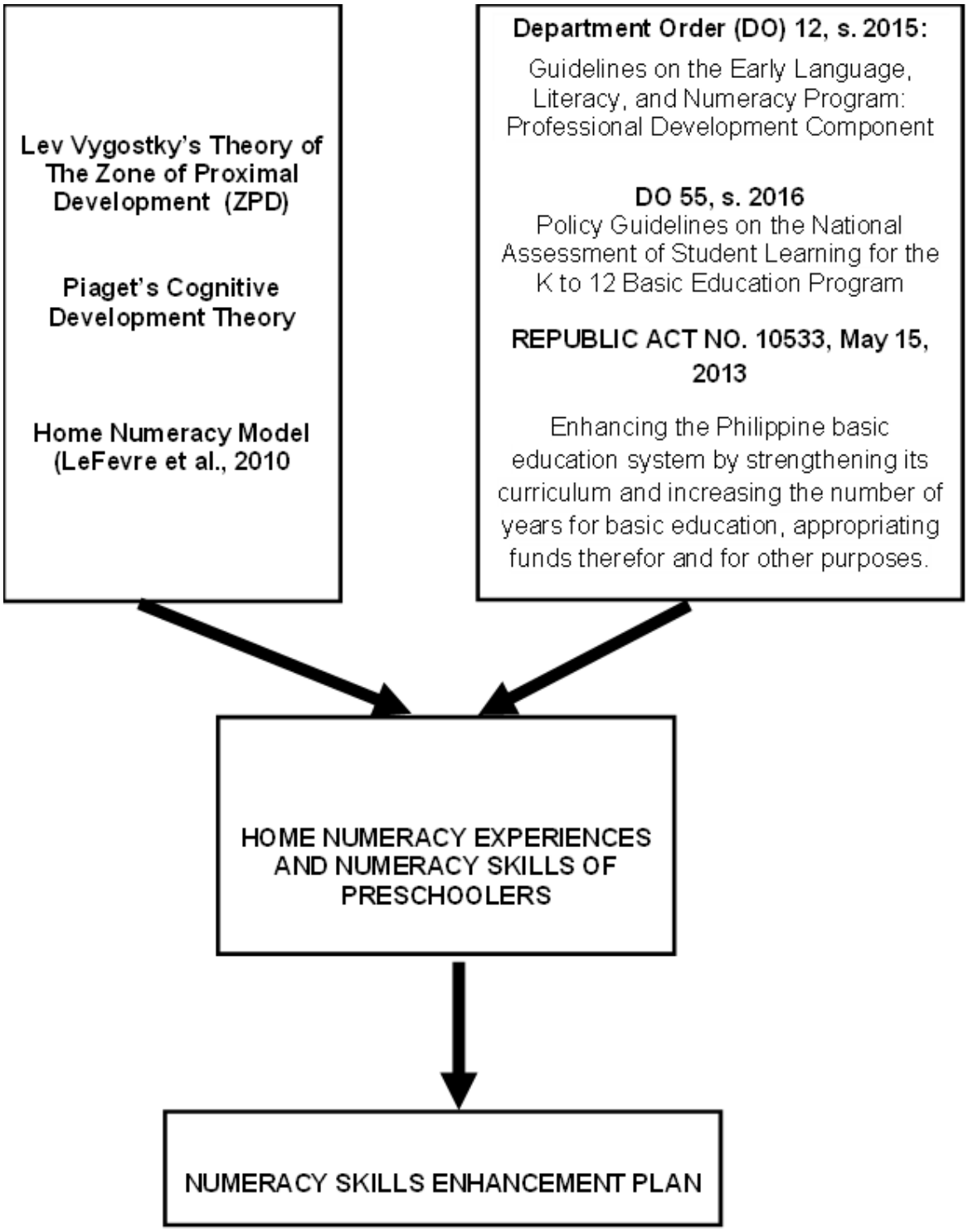

Figure 1. Theoretical/Conceptual Framework

supported by some legal bases such as; (DO) 12, s. 2015 "Guidelines on the Early Language, Literacy, and Numeracy Program: Professional Development Component.", (DO) 55, s. 2016 "Policy Guidelines on the National Assessment of Student Learning for the K to 12 Basic Education Program" and REPUBLIC ACT NO. 10533 "Enhancing the Philippine basic education system by strengthening its curriculum and increasing the number of years for basic education, appropriating funds therefore and for other purposes."

Early childhood numeracy education has garnered significant attention in educational research as it lays the foundation for future mathematical success, problem-solving skills, and critical thinking skills that help children understand and interact with the world around them. This literature review critically examines the existing body of research that uses different theories to enhance the influence of home numeracy experiences on the numeracy skills of the preschoolers.

Lev Vygotsky's theory of Zone of Proximal Development (ZPD) is a theory that emphasizes the role of social interaction and cultural tools in learning. It suggests that children learn numeracy skills through guided participation and scaffolding from parents and caregivers. In an early childhood education setting, the **Zone of Proximal Development (ZPD)** is essential in fostering numerical skills at home by emphasizing guided learning through caregiver support. Parents and educators can scaffold children's mathematical development by engaging them in meaningful, everyday numerical activities, such as counting toys, sorting objects, measuring while cooking, or recognizing numbers in books and games. By providing appropriate assistance—like modeling counting strategies, asking guiding questions, or encouraging problem-solving—adults help children progress from basic number recognition to more complex skills like addition and subtraction. Play-based activities, such as board games or puzzles, also offer structured yet enjoyable opportunities for numerical learning within the ZPD. As children gain confidence, caregivers gradually reduce their support, fostering independent problem-solving and a deeper understanding of numerical concepts. This guided, interactive approach ensures that home learning complements early childhood education, reinforcing foundational math skills in a natural and engaging way. Furthermore, in early childhood numeracy, Lev Vygotsky's Zone of Proximal Development (ZPD) highlights the space between what a child can do independently and what they can achieve with guidance, emphasizing that learning occurs most effectively within this zone of potential development. Furthermore, the Zone of Proximal Development (ZPD) highlights the importance of parents providing appropriate support to help children develop mathematical understanding.

Jean Piaget's cognitive development theory which posits that children progress through distinct stages of cognitive development is crucial for understanding early childhood numeracy skills, emphasizing the importance of developmentally appropriate learning experiences. His theory, particularly the preoperational stage (ages 2-7), highlights key cognitive processes that influence early mathematical understanding.

Piaget's Cognitive Theory also serves as a cornerstone for understanding children's cognitive growth and the acquisition of mathematical concepts during their formative years. Additionally, Piaget posited that children progress through distinct stages of cognitive development, including the sensorimotor, preoperational, concrete operational, and formal operational stages, each characterized by specific cognitive structures and developmental milestones. In the context of numeracy education, Piaget's theory highlights the importance of providing developmentally appropriate learning experiences that align with children's cognitive abilities at each stage of their development. By understanding the cognitive processes involved in assimilation and accommodation, educators can tailor instructional strategies to promote meaningful and lasting learning outcomes in numeracy education.

The Home Numeracy Model (HNM) (LeFevre et al., 2010) is a conceptual framework that links the home numeracy environment (HNE) to children's numeracy skills, suggesting that both formal and informal numeracy activities at home can influence a child's mathematical development. This theory highlights that the frequency and quality of numeracy experiences at home, emphasizing also the role of parents and caregivers directly influence preschoolers' numerical abilities.

This model suggests that children's early mathematical development is not solely dependent on formal education but also on the numeracy experiences they receive at home. Additionally, this model refers to the frequency, quality, and nature of numeracy-related activities in the home, plays a crucial role in supporting early mathematical learning. According to the HNM, formal numeracy activities—such as practicing counting, solving arithmetic problems, and engaging in structured number games—have a direct impact on children's numeracy knowledge. These activities provide explicit instruction and structured learning experiences that contribute to early numerical understanding. In contrast, informal numeracy experiences, such as discussing prices while shopping, measuring ingredients while cooking, or talking about time and distances in daily life, support mathematical thinking in a more indirect manner, helping children develop an intuitive sense of numbers and quantitative relationships. Furthermore, a home numeracy environment in early childhood education is crucial because it lays the foundation for future mathematical success, enhances problem-solving skills, and promotes a positive attitude towards math.

Legal Basis

This is to determine the relevance of the study to the government's thrust. The major sources of related legal bases are laws and department directives such as circulars, orders, memoranda, etc. These laws and department directives serve as the legal basis for the paradigm of the study. In presenting the legal bases, the researchers have to arrange the chronologically from recent to past and the relevance of each legal basis is explained. No explanation of the legal basis relevant to the present study is unscientific.

In addition to the theoretical framework, legal basis such as Department Order (DO) 12, s. 2015: Guidelines on the Early Language, Literacy, and Numeracy Program: Professional Development Component -- aims to improve reading and numeracy skills of Kindergarten to Grade 3 students through a sustainable and cost-effective professional development system for teachers.

(DO) 12, s. 2015 aims to help children be successful in learning to read, write, and count, as these skills are essential in school and later in life. One of the best predictors of school success is the level of a child's progress in these foundational skills. Although reading, writing, and number abilities increase as children grow, the early childhood years, from birth to age eight, comprise the most important period for language, literacy, and numeracy development. The ability to read, write, and count does not develop naturally, or without careful planning and instruction. The components of the early language, literacy, and numeracy program are the establishment of baseline data, pupil's profile, language used by learners, existing and functional reading and numeracy program, and support mechanisms at the ground level, materials development, development of classroom-based (formative) assessment protocol for literacy and numeracy skills, and professional development of teachers and school heads. These guidelines shall cover the professional development component of the program.

The next legal basis is the DO 55, s. 2016 Policy Guidelines on the National Assessment of Student Learning for the K to 12 Basic Education Program outlines the framework for assessing student learning within the K to 12 system, including assessment types, test development, and accommodations for learners with special needs. It introduces different national assessments at key stages of learning: the **Early Language, Literacy, and Numeracy Assessment (ELLNA)** for Grade 3, the **National Achievement Test (NAT)** for Grades 6, 10, and 12, and **Exit Assessments** for Senior High School (SHS) graduates to determine their readiness for higher education, employment, or entrepreneurship. The policy also includes the **Accreditation and Equivalency (A&E) Test** for out-of-school youth and adult learners seeking formal education equivalency. These assessments measure knowledge, 21st-century skills, and real-world learning applications using standardized tests in both paper-based and digital formats. Furthermore, the results serve as a basis for tracking student progress, evaluating teacher and school performance, and informing curriculum and policy improvements. By ensuring a structured and data-driven approach to assessment, this policy aims to enhance the quality of education in the Philippines, making learning more relevant and responsive to national and global demands.

The last legal basis is the Republic Act No. 10533, also known as the Enhanced Basic Education Act of 2013, which aims to strengthen the Philippine basic education system by increasing the number of years to 12 (K-12), including kindergarten, six years of elementary, four years of junior high, and two years of senior high school. Republic Act No. 10533 (Enhanced Basic Education Act of 2013) directly supports the development of numeracy skills by strengthening mathematics education across all grade levels in the K to 12 curriculum. It emphasizes a spiral progression approach, where mathematical concepts are introduced early and developed progressively from basic to complex levels. This ensures that students build a strong foundation in numeracy, problem-solving, and critical thinking skills necessary for real-life applications.

Additionally, the law promotes contextualized and integrative learning, meaning that numeracy is taught in ways that connect to real-world situations, making it more relevant and meaningful for students. The use of the mother tongue as the medium of instruction in early grades (Kindergarten to Grade 3) also enhances numeracy comprehension by allowing learners to grasp mathematical concepts in their first language before transitioning to English. Furthermore, Senior High School (SHS) introduces specialized tracks, including the Science, Technology, Engineering, and Mathematics (STEM) track, which deepens students' mathematical and analytical skills. Through these provisions, RA 10533 ensures that Filipino students are numerically literate and prepared for higher education, employment, and lifelong learning.

Numeracy skills in early childhood serve as the foundation for later academic success in mathematics. According to Aunio & Räsänen (2016) and Torbeyns, et al. (2015), early number skills refer to basic numerical abilities that children develop through formal and informal experiences. Formal experiences include structured teaching, such as counting exercises and number identification, while informal experiences involve real-life applications, such as measuring ingredients while cooking or playing board games with numbers. Studies further indicate that formal numeracy experiences predict symbolic arithmetic skills, whereas informal experiences relate to non-symbolic arithmetic (Soto-Calvo et al., 2019). Additionally, LeFevre et al. (2010) found that both formal and informal numerical activities significantly influence preschoolers' mathematical development.

Research indicates that children's early numeracy skills are significantly influenced by their home numeracy environment, which includes activities such as playing number-related games, counting objects, and engaging in discussions about numbers (Skwarchuk, Sowinski, & LeFevre, 2014). Thus, parental attitudes toward numeracy are also crucial, as positive attitudes enhance children's engagement and proficiency in numeracy tasks. This aligns with Vygotsky's Zone of Proximal Development (ZPD), which suggests that children acquire numeracy skills through guided participation and scaffolding provided by parents and caregivers.

Building on previous research, Skwarchuk et al. (2014) introduced the Home Numeracy Model, which differentiates between formal and informal home numeracy activities. Formal home numeracy activities, such as teaching children simple sums, printing numbers, and engaging in mental math, are linked to early symbolic knowledge. This includes counting, ordinal knowledge, and digit naming. Informal home numeracy activities, such as exposure to number games, were associated with non-symbolic math skills, such as object addition. Parents play a key role in their children's cognitive and academic development by fostering a home numeracy environment (HNE) that supports early numeracy skills (Kleemans et al. 2012; Skwarchuk et al. 2014).

While home numeracy activities positively contribute to children's numeracy outcomes, differences arise based on activity type, children's age, and targeted numeracy skills (Dunst et al., 2017; Thompson et al. 2017). Formal numeracy experiences involve a didactic focus, where parents intentionally select activities to teach specific mathematical skills, such as mental addition or numeral recognition (LeFevre et al. 2009). Parents' reports of formal numeracy activities have been associated with preschoolers' general numeracy outcomes (Thompson et al. 2017; Zippert & Ramani, 2017) and counting skills (Manolitsis et al., 2013). For kindergarteners, formal activities are linked to applied problem-solving skills (del Río, Susperreguy, Strasser, & Salinas, 2017), symbolic number knowledge (Skwarchuk et al., 2014), and arithmetic fluency in early elementary years (LeFevre et al., 2009). The complexity of formal numeracy activities also influences learning outcomes, with

advanced activities, such as mental math and solving simple sums, showing stronger associations with numeracy skills (Skwarchuk et al., 2014).

In contrast, informal numeracy activities involve incidental learning of numerical or mathematical concepts. Examples include playing board games with numerical elements, engaging in card games, or cooking activities that involve measurement and estimation. While these activities provide opportunities for children to develop numeracy skills, learning mathematics is not their primary focus (Skwarchuk et al., 2014; Sonnenschein et al., 2012).

However, the distinction between informal and formal home numeracy activities has been debated due to challenges in establishing construct validity. Additionally, both types of activities have been found to predict similar math skills, raising concerns regarding their predictive validity in relation to later math performance (Elliott & Bachman, 2018; Huntsinger et al. 2016; LeFevre et al., 2009; Susperreguy et al., 2020). Some researchers have chosen to combine formal and informal home numeracy activities into an overall score or focus on a single category (Elliott & Bachman, 2018). Nonetheless, Susperreguy et al. (2020) found that both types of home numeracy activities uniquely predicted children's performance, suggesting that they should be examined separately. Despite these debates, parents are encouraged to integrate both formal and informal numeracy activities, as they collectively contribute to children's long-term mathematical development Susperreguy et al. (2020).

In conclusion, the integration of theoretical frameworks, empirical studies, and existing models provides a comprehensive understanding of home numeracy experiences and preschoolers' numeracy skills. By establishing connections between these elements, this research aims to explore the significant relationship between home numeracy experiences and numeracy skills, contributing to the development of strategies for enhancing early mathematical learnin

THE PROBLEM

Statement of the Problem

This research assessed the influence of home numeracy experiences on the numeracy skills of the preschoolers at Leyte Normal University – Integrated Laboratory School in Tacloban City for school year 2024-2025 as basis for a proposed numeracy skills enhancement plan.

Specifically, it sought answers to the following queries:

1. As reported by the parent-respondents, what is the level of exposure of their child on the home numeracy experiences in terms of:

1. numeracy skills,
2. number books,
3. games, and
4. application?

2. What is the level of numeracy skills of the preschoolers in terms of:

1. numbers,
2. identifying attributes,
3. thinking skills?

3. Is there a significant relationship between the home numeracy experiences and the numeracy skills of preschoolers?
4. Based on the findings, what numeracy skills enhancement plan can be crafted?

Statement of the Null Hypotheses

Based on the objectives of the study, the following null hypotheses will be tested at 0.05 level of significance:

Ho: There is no significant relationship between the home numeracy experiences and the numeracy skills of preschoolers.

Significance of the Study

Department of Education Officials. The results of this study will serve as a guide to top officials at the Department of Education as they shape the policy, professional development, support systems, and advocacy efforts that directly impact programs that emphasize early numeracy development, integrating parental involvement in foundational learning strategies.

School Administrators. They play a significant role in implementing numeracy programs that strengthen home-school partnerships, encouraging parents to engage in meaningful numeracy activities with their children. Their leadership, resource allocation decisions, commitment to professional development, and facilitation of collaboration and communication efforts are essential for supporting children's numeracy skills. The findings of this study would be valuable inputs in their decision-making as they implement educational programs for very young learners.

Teachers. Teachers can use insights from the study to tailor their teaching methods to align with the home numeracy experiences of their students, making lessons more relatable and effective. This will also emphasize the importance of teacher-parent collaboration, encouraging educators to guide parents on how to integrate numeracy into daily home activities.

Preschoolers. This study is highly significant for preschoolers as it provides policy makers and numeracy program implementors essential insights for designing programs that recognize the value of early numeracy experiences for the mathematical development of very young learners.

Researchers. The experience of conducting this study will help the researcher grow professionally by acquiring skills required needed to conduct a research study. More significantly, the results of this study will be the contribution of the researcher to early childhood education, specifically in highlighting the importance of home numeracy experiences of preschoolers for further developing their numeracy skills.

Future Researchers. This study will guide future researchers who will be conducting related studies and perhaps the same variables to generate more knowledge on enhancing the numeracy skills development of preschoolers.

RESEARCH METHODOLOGY

This section provides a comprehensive overview of the research methodology, including the design, flow, environment, respondents, instruments, and procedures used in the study, along with the statistical methods applied to the data.

Design

This study utilized a descriptive-correlational research design, which, defined by authors like McBurney & White (2009) and Curtis et al. (2016) was considered appropriate for the investigation as it allowed the researcher to examine the relationship between two key variables—home numeracy practices and preschoolers' mathematical development—without manipulating or altering the conditions under which they naturally occurred.

The primary goal was to describe and quantify the relationships that exist between two or more variables within a population, not to establish cause-and-effect relationships. Unlike experimental designs, descriptive-correlational research does not involve manipulating or controlling any variables.

It determined the **numeracy skills** of the **kindergarten pupils in Leyte Normal University – Integrated Laboratory School,** for the school year 2024-2025.

Flow of the Study

The study followed an Input-Process-Output (IPO) system model in gathering the essential data needed for the study. Figure 2 illustrates the process of data gathering.

The first stage determined the input of the study, such as the profile and the numeracy skill of the kindergarten pupil in a private education institution for the school year 2024-2025.

The second stage is the process of the study. It incorporated the following tasks: the researcher transmitted the necessary documentation before data gathering, including the letter allowing the study's conduct and the respondents' consent form. Having it approved, the researcher began distributing the questionnaire to the respondents to ensure that all parts of the questionnaire were completed. The researcher then proceeded to tally, organize, summarize, interpret, and analyze the data results. Appropriate statistical tools were used in the treatment of data.

The last stage was the formulation of the output of the study. An intervention plan was proposed to address the needs of the kindergarten pupils.

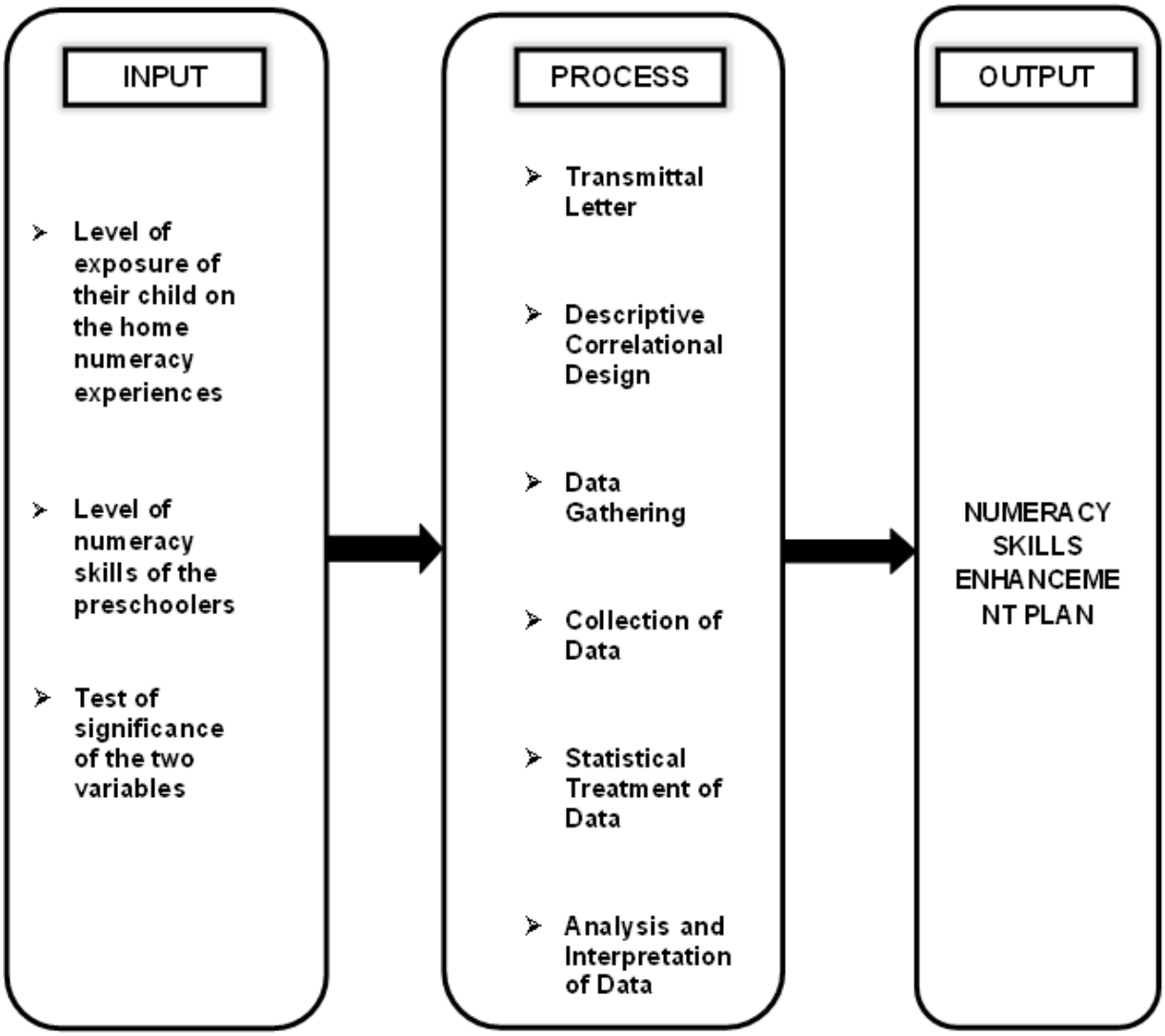

Figure 2. Flow of the Study

Environment

The study was conducted at the Leyte Normal University - Integrated Laboratory School located in Barangay 63, Paterno Street, Tacloban City, 6500. The history of Leyte Normal University traces its roots back to the pre-war years, reflecting its long-standing commitment to education and academic excellence. Established in 1921, it began as the Provincial Normal School, initially functioning as an extension of Leyte High School. In 1976, it became Leyte State College, and later, Leyte Normal University, reflecting its continued commitment to teacher education and its growth in scope. Over the years, the institution experienced steady growth, evolving to meet the increasing demands not only for teacher education in the region but also offering even more academic programs.

Its Integrated Laboratory School (ILS), part of the LNU, serves as a crucial on-campus internship for students in the College of Education, providing them with practical experience before their off-campus internships in elementary schools in the region. It allows them to apply their theoretical knowledge in real-world classroom settings, enhancing their teaching skills and pedagogical understanding. The laboratory school serves as a model for effective teaching and learning, showcasing LNU's commitment to academic excellence and preparing its graduates for successful careers in education.

Currently, there are 590 students who are officially enrolled in the LNU-ILS from Kindergarten up until Senior High School for the School Year 2024-2025.

Figure 5. Location Map of the Research Environment

Respondents

The study focused on the Kindergarten pupils enrolled at Leyte Normal University – Integrated Laboratory School. As there were only 44 kindergarten pupils enrolled at LNU-ILS during the school year under study, the whole population of kindergartners, as well as their parents, were taken as respondents.

Table 1

Name of School	n	Percentage
Leyte Normal University – Integrated Laboratory School	**44**	**100.00**
Total	**44**	**100.00**

Distribution of the Respondents

Table 1 showed the number of respondents surveyed for this study. There were 44 students in Leyte Normal University – Integrated Laboratory School. Total enumeration of respondents was used.

Instruments

Two data-gathering instruments were used in this study. One, a survey questionnaire, was composed of statements describing activities of the parents and the child that help the child develop his/her numeracy skills. The researcher personally administered the questionnaire to the parents of the participating pupils. The parent-respondents were asked to select one of the five options for each statement, utilizing a 5-point Likert Scale to indicate the level of occurrence. Responses to each item in the questionnaire were scored as follows: 4 - Almost Daily, 3 - Few Times a Week, 2 - Once a Week, 1 - Less than a Week but a few times a month, and 0 - Did not Occur. All data were collected in strict compliance with the provisions of the Data Privacy Act, thus ensuring utmost confidentiality in the handling of said data.

To assess the preschoolers' numeracy level in the three components of numbers, identifying attributes, and thinking skills, the teacher-in-charge of the LNU-ILS Kindergarten class rated her pupils using the Kindergarten Numeracy Checklist developed by the Department of Education. Based on his/her ratings on the checklist, each kindergartener was categorized into one of three levels – Advanced, Intermediate, and Beginner.

Data Gathering Procedure

Preliminary Stage. The researcher initially sent letters to the Office of the Principal, Subject Area Coordinator, and the parents of the pupils to ask for permission to conduct the study. Upon receipt of approval, the researcher finalized the schedule for meeting the respondents and personally administering the questionnaire.

Data Gathering Stage. On the scheduled date, the researcher facilitated a brief orientation regarding the research. Salient issues like the purpose of the study, its procedure, and how the confidentiality of the respondents would be protected were discussed. Administration of the survey questionnaires followed right after the orientation. Instructions were given on how to answer the survey questionnaires. Assistance was also provided while the respondents were answering the survey questionnaires, and enough time was given to answer the said questionnaires. Retrieval of the questionnaires followed.

Post Data Gathering Stage. Using the aforementioned data-gathering instrument and appropriate statistical tools for the treatment of data, the researcher then tallied, organized, summarized, analyzed, and interpreted the results. An intervention plan was designed and proposed for implementation to address the specific needs of the preschool pupils enrolled at Leyte Normal University – Integrated Laboratory School.

Statistical Treatment of the Data

After data collection, the data gathered underwent different statistical treatments with the aid of the statistician. To arrive at reliable results, the following statistical tools were used:

Frequency Count. Frequency counts were used to determine the number of preschoolers who belong to a certain numeracy level.

Percentage. Percentage was computed to determine the proportion of the learners who fall under a specific category in numeracy skills in relation to the total number of respondents.

Weighted Mean. The weighted mean was used to determine the level of exposure of their child on the home numeracy experiences.

Pearson Product-Moment Correlation Coefficient (PPMCC). This statistical was used to test the level of significance of the relationship between the home numeracy experiences and the numeracy skills of the preschoolers.

Scoring Procedure

Data that were collected through survey questionnaires were analyzed and interpreted according to the following procedures:

To determine the respondents' **home numeracy experiences** the following numerical and descriptive ratings were used:

Scale	Numerical Rating	Descriptive Rating	Verbal Interpretation
4	3.21-4.00	Highly Exposed	The preschoolers consistently engage with numbers and math concepts at home. They frequently count objects, recognize patterns, and participate in number-related activities with enthusiasm and understanding.
3	2.41-3.20	Exposed	The preschoolers have regular opportunities to interact with numbers and math concepts at home. They show a developing understanding of counting, basic shapes, and simple measurement through everyday activities.
2	1.61-2.40	Moderately Exposed	The preschoolers have some exposure to numbers and math concepts at home, but may not consistently engage in related activities. They may require more focused encouragement and support to develop their numeracy skills.
1	0.81-1.60	Less Exposed	The preschoolers have limited opportunities to interact with numbers and math concepts at home. They may need more exposure to counting, sorting, and other foundational numeracy activities to build their understanding.
0	0.00-0.80	Not Exposed	These preschoolers have minimal to no interaction with numbers or math concepts in their home environment. They will require a focused introduction to basic numeracy skills and concepts to begin building a foundation.

DEFINITION OF TERMS

Some terms used in this study are operationally defined as follows:

Application. This refers to the practical use of the developed numeracy skills enhancement plan by teachers in their classroom instruction.

Development. This refers to the process of designing and creating the numeracy skills enhancement plan, including the selection of activities, resources, and evaluation methods.

Games. This refers to educational, digital or physical games used as tools to reinforce and practice numeracy concepts, specifically those incorporated into numeracy activities.

Home Numeracy Experiences. This refers to the frequency and type of numeracy-related activities that children engage in at home, as reported by parents or guardians, and how these activities support their numeracy development**.**

Number Books. This refers to books for children that focus on numerical concepts, counting, and mathematical problem-solving, used as a resource in numeracy activities.

Numeracy Skills. This refers to a child's demonstrated ability to understand and apply numerical concepts, including counting, comparing quantities, basic arithmetic operations, and problem-solving involving numbers, as measured by a standardized numeracy assessment tool.

Numeracy Skills Enhancement Plan. This refers to a structured set of activities, resources, and assessment tools designed to improve children's numeracy skills within a specific timeframe, as developed based on the findings of this study.

Numeracy Activities. This refers to specific, structured tasks or exercises intentionally designed to enhance numeracy skills—such as counting, sorting, measuring, and problem-solving—based on the findings of this study and developed by the researchers accordingly.

Teacher's Performance. This refers to the teacher's ability to effectively implement the numeracy skills enhancement plan, as measured by observations, self-reports, and student numeracy gains.

CHAPTER 2

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter shows the results of this study presented in tabular and textual form and arranged in the order of the research questions raised. This also contains the results of statistical analysis of data obtained during the conduct of the study as well as their interpretation. The findings centered on the child's level of exposure to home numeracy experiences in terms of: numeracy skills, number books, games, and application; the level of numeracy skills of the preschoolers in terms of: numbers, identifying attributes, thinking skills; and the significant relationship or the lack thereof between preschoolers' exposure to home numeracy experiences and their numeracy skills.

Level of Exposure to Home Numeracy Experiences

Level of Exposure to Numeracy Skills

Introducing numeracy skills early in life plays a crucial role in establishing a strong mathematical foundation for children. Preschoolers have the opportunity to develop a sense of numbers, patterns, counting, and problem-solving through structured as well as unstructured ways. Additionally, research suggests that early mathematical experiences have a substantial impact on later mathematics achievement and overall academic performance (Clements & Sarama, 2011).

Table 2. Level of exposure of the preschoolers to home numeracy experiences in terms of numeracy skills

S/N	Indicators	WM	SD	Verbal Description
1	Counting objects	3.66	0.64	Very High
2	Sort things by size, color or shape	3.52	0.79	Very High
3	Counted down (10, 9, 8, 7 ...)	3.57	0.70	Very High
4	Printing numbers	3.18	1.02	High
5	Identifying names of written numbers	3.41	0.82	Very High
Aggregate Weighted Mean		**3.47**		**Very High**
Aggregate Standard Deviation			**0.79**	

Legend:3.25-4.00-Very High; 2.50-3.24-High; 1.75-2.49-Low;1.00-1.74-Very Low

Table 2 shows the level of exposure to home numeracy experiences in terms of counting objects; sorting things by size, color, or shape; counting down (10, 9, 8,7…); printing numbers; and identifying names of written numbers, with their corresponding Weighted Mean (WM), Standard Deviation (SD), and Verbal Description, which provides a qualitative interpretation of the quantitative results.

The data show that counting objects has the highest mean score (WM of 3.66 and SD of 0.64) that falls under the "Very High" verbal description, suggesting that this is the most commonly practiced numeracy activity at home. Sorting things by size, color, or shape also falls within the "Very High" category with WM 3.52 and SD 0.79, as well as counting down or backwards with a WM of 3.57 and SD of 0.70. Printing numbers, on the other hand, is only rated "High" and has the lowest mean of WM 3.18 and has the highest standard deviation SD of 1.02, indicating less frequent and more inconsistent numeracy experiences at home. The last activity, identifying names of written numbers, falls under the "Very High" verbal description with WM of 3.41 and SD of 0.82.

The home learning environment (i.e., shared parent-child activities at home) plays an important role in developing literacy and numeracy skills (e.g., Scarborough and Dobrich, 1994; Sénéchal and LeFevre, 2002; Mol and Bus, 2011; Silver et al., 2020). Most studies suggest that the extent of parental provision of home numeracy activities is correlated with children's current numeracy performance (Blevins-Knabe and Musun-Miller, 1996; Skwarchuk, 2009; De Florio and Beliakoff, 2015; Zippert and Ramani, 2017). This does not necessarily indicate that the home numeracy activities are causing the children's better numeracy performance. It could either reflect parental response to their children's interest and ability in numeracy, or parental influence on their children's numeracy ability.

Level of Exposure to Number Books

Exposure to number books is essential for developing early numeracy skills among preschool-aged children. These books usually incorporate numbers, counting, and basic mathematical concepts into engaging stories and visuals, helping to ignite children's interest in mathematics from a young age. Van den Heuvel-Panhuizen and Elia (2012) provided the foundation for using picture books to teach mathematics research, claiming that children's number books can bring mathematical content into everyday life and nurture their understanding in the early years.

Table 3. Level of exposure of their child to home numeracy experiences in terms of number books

S/N	Indicators	WM	SD	Verbal Description
6	Connect-the-dot" activities	2.89	1.10	High
7	Using number activity books	2.73	0.97	High
8	Reading number storybooks	2.61	0.97	High
Aggregate Weighted Mean		**2.74**		**High**
Aggregate Standard Deviation			**1.02**	

Table 3 presented how often children are exposed to various number related activities at home that involve number book activities such as connect-the-dot activities, using number activity books, and reading number storybooks.

The data gathered show that connect-the-dot activities have the highest mean among the indicators WM 2.89 with SD 1.10, indicating it is the most commonly used number book activity at home. Using number activity books with WM 2.73 and SD of 0.97, on the other hand, is slightly lower than connect-the-dot activities, but is still high in usage. The lowest among the three is the reading number story book activity that has a WM of 2.61 and SD 0.97 but still falls under the "High" category. The aggregate WM of 2.74 suggests that, overall, children experience a high level of exposure to number book activities at home. The aggregate SD of 1.02 indicates moderate variability—some families may use these resources more intensively than others. This consistent classification under the "High" category across all indicators highlights the strong presence of number book activities in the home numeracy practices of the participating families.

Studies have pointed to the positive relationship between parent-child interactions in the numeracy activities that include numerical content, attention focus, emotions, and social connection (Skwarchuk, Vandermaas-Peeler & LeFevre,2016; Vandermaas-Peeler, Westerberg & Fleishman, 2019). Echoing Vygotsky's social development theory (Vygotsky, 1978), researchers have identified parental involvement in children's early numeracy as a form of social internalization of knowledge (Edens & Potter 2013). To put it simply, the parent-child interactions in numeracy are considered as one of the critical educational capitals and resources.

Level of Exposure to Games

Playing math games helps build numeracy skills through lots of meaningful interactions between children and their parents. According to a study by Skwarchuk, Sowinski, and LeFevre (2014), play activities at home that are related to numeracy—particularly those with game-like interactions—are positively associated with children's understanding of symbolic numbers and their later success in math.

Table 4. Level of exposure of their child to home numeracy experiences in terms of games

S/N	Indicators	WM	SD	Verbal Description
9	Playing card games	2.11	0.89	Low
10	Making collections	2.18	1.04	Low
11	Playing board games with die or spinner	2.00	0.89	Low
12	Being timed	2.43	1.17	Low
Aggregate Weighted Mean		**2.18**		**Low**
Aggregate Standard Deviation			**1.00**	

Table 4 presents data on how often the children surveyed were exposed to numeracy-related experiences through games at home. (Games can be created by teachers or parents to target specific math skills or existing games can be used or modified as well (Ramani & Eason, 2015). This allows students to have fun and play while learning, making the math more meaningful in their life. The more repetition and practice a student has for a skill, the more in-depth they will understand that skill (Fuson, Sarama, & Clements, 2015).) The table includes four specific indicators (activities) such as playing card games, making collections, playing board dames with die or spinner, and being timed. Each activity was assessed using a Weighted Mean (WM) and Standard Deviation (SD). The scores were then interpreted using a verbal description to indicate the level of exposure. The aggregate scores provide an overall view of the general exposure level across all listed activities.

The parent-child interactions in numeracy are grouped into two: formal and informal (Cahoon, Cassidy, & Simms, 2017). Formal activities refer to a well-structured outline of teaching and learning guides with explicit instruction. Informal activities, on the other hand, are the result of situational or incidental learning. The learning prompt at home may occur during a visit to a museum (Vandermaas-Peeler, Massey, & Kendall, 2016), playing board or card games (Ramani & Scalise 2020), money-talk when shopping (Barrera-Mora & Reyes-Rodriguez, 2019), and measuring ingredients when cooking (Son & Hur, 2020; Finn &Vandermaas-Peeler, 2013). The endless possibilities to infuse numeracy learning at home means that the preschool period may be an especially important time to examine the effects parents can have in developing children's mathematical skills.

As shown in Table 4, the relatively low WM of 2.11 indicates that playing card games, which can involve counting, sequencing, and probability concepts, is not a common home numeracy activity among the survey participants. The SD of 0.89 suggests that there is moderate consistency among respondents, with some variation in how frequently children engage in this activity. Making collections is also infrequently practiced at home, with WM of 2.18 and SD of 1.04 indicating higher variability among families, with some children possibly engaging more frequently than others. Indicator 11, playing board games with die or spinner, is reported as being one of the least practiced numeracy games at home with WM of 2.00 and an of SD 0.89 – suggesting a fairly consistent response pattern. Indicator 12, though higher than the others, is still within the "low" range with a WM of 2.43 and SD 1.17. The higher SD (1.17) reflects greater variability in responses, indicating that while some

children might be frequently timed in math tasks, many are not. Furthermore, the average WM (2.18) confirms that, overall, children's exposure to home numeracy experiences through games is low. Furthermore, the Aggregate Standard Deviation (1.00) shows moderate variability across the responses, indicating differences in how individual families engage their children with numeracy-related games.

Overall, the data in Table 4 reveals that children generally have low exposure to numeracy-enhancing games at home. While such activities are known to foster mathematical thinking in enjoyable and informal ways, the findings suggest they are not regularly incorporated into the home routines of the kindergartners surveyed. This points to a potential area for educational interventions or parental guidance to promote numeracy development through playful learning.

Level of Exposure to Application

Young children who experience hands-on numeracy through activities that occur naturally at home, like cooking or wearing a watch, or using a calculator, provide opportunities for these foundational math skills to be reinforced in a meaningful way. These informal experiences help children engage with numbers, measurement, and time in meaningful ways. As Purpura, Schmitt, and Ganley (2017) pointed out in their research that such daily numeracy practices, especially those involving measurement and time, positively influence children's mathematical development. For example, measuring cooking ingredients supports in understanding quantity and sequencing (Skwarchuk, Sowinski, & LeFevre, 2014), while wearing a watch introduces the concept of time and number recognition.

Table 5. Level of exposure of their child on the home numeracy experiences in terms of application

S/N	Indicators	WM	SD	Verbal Description
13	Having your child wear a watch	3.02	1.03	High
14	Measuring ingredients when cooking	1.98	0.92	Low
15	Using calendars and dates	2.45	1.00	Low
16	Talking about money when shopping (e.g., “which costs more?”)	2.45	1.09	Low
17	Playing with calculators	1.84	0.81	Low
Aggregate Weighted Mean		**2.35**		**Low**
Aggregate Standard Deviation			**0.97**	

Table 5 presents the level of exposure to numeracy experiences the children receive at home, particularly in terms of application. These experiences are essential parts of early mathematical development as they integrate everyday life contexts with basic mathematical concepts. The table assesses five particular indications of numeracy application using weighted means (WM), standard deviations (SD), and accompanying verbal descriptions.

As shown in the table, having the child wear a watch received the highest mean score of 3.02, with a verbal description of "High". This implies that the most often used among the five application-based numeracy strategies is motivating young children to wear watches. All other indicators, in contrast, lie below the midpoint of the scale and have a "Low" verbal descriptor. The aggregate weighted mean of 2.35, which is classified as "Low," suggests that the children in the study have overall limited exposure to numeracy-related applications at home. This indicates that the family environment does not frequently provide children with the opportunity to engage in mathematical thinking through real-life activities. The aggregate standard deviation of 0.97 further implies moderate variability in responses, indicating some inconsistency in the practices among the households surveyed.

In summary, the findings presented in Table 5 underscore a generally low level of home-based numeracy application, revealing a missed opportunity to incorporate everyday routines and real-life contexts—such as telling time, handling money, or measuring—into meaningful mathematical experiences for young children. This highlights the need for increased parental awareness and

guidance on how to naturally embed numeracy learning into daily interactions, which could significantly enhance early mathematical development in a practical and engaging manner.

Summary of the Level of Exposure of Kindergarten Pupils to Home Numeracy Experiences

This section presents the findings on the level of exposure of Kindergarten pupils on their home numeracy experiences in terms of numeracy skills, number books, games, and application.

Table 6. Summary on the level of exposure of the pupil respondents to the four main components of home numeracy experiences

Components	WM	SD	Verbal Description
Numeracy Skills	3.47	0.79	Very High
Number Books	2.74	1.02	High
Games	2.18	1.00	Low
Application	2.35	0.97	Low
Grand Mean	**2.69**		**High**
Grand Standard Deviation		**0.95**	

Table 6 provides a summary of the findings on the level of exposure of the pupil respondents to the four components of home numeracy experiences. It uses Weighted Mean **(WM)** and Standard Deviation **(SD)** to summarize responses for each component, along with a Verbal Description that categorizes the level of exposure to each of the four components.

The data shows Numeracy Skills to have the highest mean score WM (3.47), indicating that children are very frequently exposed to numeracy skills at home. The low SD (0.79) suggests that most responses are relatively consistent – that is, that most families provide their children similar levels of exposure to numeracy skills. Number Books likewise posted a high level of exposure to number-related books with a WM of 2.74. The higher SD (1.02) compared to Numeracy Skills suggests greater variability in how often children access number books — some children might be frequently exposed, while others much less so. Games got a WM of 2.18 and Application got a WM of 2.35 – both scores indicating that these types of home numeracy activities are not commonly conducted at home.

Overall, children experience a "High" level of home numeracy exposure, but this overall score is pulled up by the very high exposure to numeracy skills. The Grand SD (0.95) suggests a moderate level of inconsistency across different households in terms of the exposure provided.

Children begin to develop mathematics skills early in life, even prior to formal schooling and without direct instruction (Feigenson et al., 2004, Fuson, 1988, Mix, 2009, Sarama and Clements, 2009). These informal mathematics skills are acquired through children's daily interactions with their environments (Ginsburg, Cannon, Eisenband, & Pappas, 2006) and serve as an important prerequisite for understanding and acquiring more complex mathematics skills (Baroody et al., 2006, Jordan et al., 2009). Informal numeracy is composed of three distinct components: numbering, relations, and arithmetic skills (National Research Council, 2009, Purpura and Lonigan, 2013). For most children, acquisition and mastery of early numeracy skills occurs spontaneously through activities in the home and other experiences in the child's everyday environment (LeFevre et al., 2009).

LEVEL OF NUMERACY SKILLS

Level of Numeracy Skills of Preschoolers in terms of Numbers

Preschoolers reportedly acquire numeracy skills gradually, starting with non-symbolic knowledge of quantities and working toward symbolic number knowledge. Children's early numeracy skills are categorized in a few interconnected domains: numbering, relations, and arithmetic operations (National Research Council, 2009). Numbering skills include knowledge of the rules of the counting sequence and the ability to flexibly obtain quantity (Purpura & Lonigan, 2013). The majority of children are capable of reciting the count list to 20 by the time they reach the age of five, using it to enumerate sets, and comprehending the cardinality principle. They also learn to determine the ordinality of single-digit numerals and recognize written numerals.

Table 7. Level of numeracy skills of the preschoolers in terms of numbers

Level	f	%
Advanced	36	81.82
Intermediate	7	15.91
Beginner	1	2.27
Total	**44**	**100.00**

Table 7 shows the level of numeracy skills of the 44 preschoolers in terms of numbers. Of the 44 surveyed, 36 kindergartners, representing 81.82% of the total population, were identified as having advanced-level numeracy skills. Seven or 15.91% of the kindergarten pupils demonstrated an intermediate level of proficiency. Notably, only one kindergarten pupil (2.27%) was classified under the beginning level, indicating that a small number of learners require foundational support in numeracy.

Level of Numeracy Skills of Preschoolers in terms of Attributes

According to the National Association for the Education of Young Children Position Statement on Early Childhood Mathematics, "Mathematics helps children make sense of their world outside of school and help them construct a solid foundation for success in school." Children have a natural and spontaneous interest in math as they wonder which items are bigger and sort different toys by type. Furthermore, early math and numeracy is the general understanding of numbers and basic mathematical concepts (Harris & Petersen, 2019; Toll & Van Luit, 2014). These are skills such as counting, comparing and contrasting, describing shapes and positions and problem solving (Aunio, Heiskari, Van Luit & Vuorio, 2015; Aubrey & Godfrey, 2003; Harris & Petersen, 2019; Ramani & Eason, 2015)

Table 8. Level of numeracy skills of the preschoolers in terms of identifying attributes

Level	F	%
Advanced	35	79.55
Intermediate	8	18.18
Beginner	1	2.27
Total	**44**	**100.00**

Table 8 showed the distribution of the kindergartners' numeracy skills based on their ability to recognize attributes. Based on the data, the vast majority of the kindergartners surveyed (35 out 44, or 79.55%) demonstrated an advanced level of proficiency in this domain. This implies that most of the kindergarten pupils are already proficient in recognizing and distinguishing attributes such as colors, shapes, and size – a crucial foundation skill in early numeracy development. On the other hand, 8 respondents (18.18% of the population) exhibited an intermediate level of skill. This reflects a halfway understanding of attribute identification, which can be developed and supported through instruction and practice. There was only one child (2.27% of the total respondents) who was categorized as belonging to the beginner level. This relatively low percentage suggests that although difficulties in identifying attributes are not common among the respondents, this single instance suggests there might be a need to ascertain the cause of the delay in this aspect of math skills development.

Level of Numeracy Skills of Preschoolers in terms of Thinking Skills

Curiosity, creativity, collaboration, critical thinking, inquiry and exploration are skills that are foundational parts of math learning and they are innate skills in young children and the early childhood learning process (Chesloff, 2013). Children also need to learn logical thinking, problem solving and reasoning skills alongside early math instruction. In fact, researchers have suggested that logical thinking is the most important skill for early math and numeracy learning (Aunio et al., 2015).

Table 9. Level of numeracy skills of the preschoolers in terms of thinking skills

Level	F	%
Advanced	37	84.09
Intermediate	6	13.64
Beginner	1	2.27
Total	**44**	**100.00**

Table 9 gave a detailed analysis of the level of numeracy of the preschooler in terms of thinking skills. Based on the data, the participants in the survey were categorized into three proficiency levels: Advanced, Intermediate, and Beginner.

As shown in the table, there were 37 kindergarten pupils (84.09%) who demonstrated advanced numeracy skills in terms of thinking. This indicates that most children from the group are capable in matching, sorting, seriating objects, and possibly comprehending early mathematical concepts. On the other hand, a smaller portion of the group (6 out of 44 or 13.64%) fall under the intermediate level. This may indicate that these pupils possess foundation numeracy skills but still need support and reinforcement to reach advanced level. Notably, only one (1) child or 2.27% of the population is categorized at the beginner level, indicating a very limited grasp of numeracy in terms of thinking skills. Although this represents a small percentage, it is still crucial to consider the potential reasons for it and the necessity for individual support or assessment that will address the possible cause. Young students' brains are naturally receptive to logic and math skills which makes the early childhood years the best time to begin teaching early math and numeracy skills (Chesloff, 2013).

RELATIONSHIP BETWEEN HOME NUMERACY EXPERIENCES AND NUMERACY SKILLS OF PRESCHOOLERS

This section discusses the relationship between home numeracy experiences and numeracy skills of the preschoolers as determined through the use of Pearson Product-Moment Correlation Coefficient (PPMCC).

Table 10. Test of relationship between the home numeracy experiences and the numeracy skills of preschoolers

Variables	r-value	Strength of Correlation	p – value	Decision	Remarks
Home Numeracy Experiences and The Numeracy Skills	0.409*	Weak Positive	0.006	Reject Ho	Significant

*significant at $p<0.05$ (two-tailed)

Table 10 shows a significant relationship between the preschoolers' home numeracy experiences in terms of numeracy skills, number books, games, and application and their level of numeracy skills. Shown in the table is the computed Pearson correlation coefficient (r-value) of 0.409 which indicates a weak positive correlation between home numeracy experiences and numeracy skills of preschoolers. The p-value which is 0.006 is less than the significance level of 0.05, implies, however, that the observed relationship is statistically significant. Therefore, the null hypothesis (Ho) that states there is no significant relationship between home numeracy experiences and numeracy skills of preschoolers, is rejected. The significant relationship between home numeracy experiences and preschool children's numeracy skills suggests that numeracy activities and experiences that take place at home –– such as counting games, number-related activities, and playing number-based toys -- have significant impact in promoting children's early numeracy development. Although the correlation is weak, still it is significant enough to highlight the role of the home environment in shaping the fundamental numeracy skills of preschoolers.

Since young children are the most receptive to learning, it is crucial to start teaching them math skills at an early age. Children's innate curiosity, inquiry, and exploration of their surroundings are bolstered by early math and numeracy skills (Chesloff, 2013; Harris & Petersen, 2019). Additionally, according

to Fuson, Sarama, and Clements' (2015) study, children can naturally discover and experiment with the environment around them to learn basic math ideas, but they also require adult assistance and support their learning as well.

Formal numeracy activities improve number identification and naming as well as counting (Clerkin & Gilligan, 2018). While informal numeracy activities help children improve non-symbolic skills, number sense and more general math achievement (Clerkin & Gilligan, 2018; Hanley, 2005). Over all, both formal and informal numeracy activities are necessary for early math development.

By incorporating informal and formal early math and numeracy activities into daily life at home and in school, children can be prepared for math learning in elementary school. Parents and educators may consider the use play, games, books, songs and daily conversations to boost math learning. Both parents and educators, it may be added, have the capacity and the responsibility to provide formal and informal numeracy learning activities for the children under their care.

CHAPTER 3

SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATION

This chapter presented the summary, findings, conclusion and recommendation which may serve as guide for teachers, administrators, supervisors and other constituents.

SUMMARY

This study aimed to assess the influence of home numeracy experiences on the numeracy skills of the preschoolers at Leyte Normal University – Integrated Laboratory School in Tacloban City for school year 2024-2025 as basis for a proposed numeracy skills enhancement plan. Overall, there were 44 preschoolers surveyed. All of the preschoolers' parents answered the printed survey questionnaire that sought to gather the home numeracy experiences of the preschool pupils in terms of: numeracy skills, number books, games, and application; and their level of numeracy skills in terms of: numbers, identifying attributes, thinking skills.

The gathered data about the preschoolers' profile as to their level of numeracy skills and their level of exposure to home numeracy experiences were statistically treated and analyzed using frequency count, simple percentages, weighted mean (WM), and standard deviation (SD). Furthermore, the weighted mean was used to treat and analyze the data about the influence of home numeracy experiences and numeracy skills of preschoolers in terms of: numeracy skills, number books, games, and application; and the level of numeracy skills of the preschoolers in terms of: numbers, identifying attributes, thinking skills. The Pearson Product-Moment Correlation Coefficient (PPMCC) was utilized to test for relationship between home numeracy experiences and numeracy skills of preschoolers. The study's findings served as the basis for developing its output.

FINDINGS

A total of 44 preschoolers were surveyed in this study. The results showed a significant relationship between home numeracy experiences and the numeracy skills of the preschoolers in the study.

The significant relationship between home numeracy experiences and preschool children's numeracy skills can be observed in the various factors of: numeracy skills, number books, games, and educational applications. Additionally, the data revealed insights into the preschoolers' numeracy skills in the areas of numbers, identifying attributes, and thinking skills.

The kindergarteners at LNU-ILS had a high level of exposure to home numeracy experiences. But considering that they had a very high level of exposure to numeracy skills, a high level of exposure to number books, but a low level of exposure to both games and application, it can be inferred that this overall score was pulled up by the very high exposure to numeracy skills. This means that games and attributes are not commonly conducted at home. The Grand SD on the other hand suggests a moderate level of inconsistency across different households in terms of the exposure provided. Meanwhile, most of the respondents were already in the advanced level in terms of numeracy skills of numbers, identifying attributes, and thinking skills. Notably, there was only one from the population who was categorized in the beginner level in all three domains of numeracy skills.

Statistical test results indicated a weak positive correlation between home numeracy experiences and numeracy skills of the preschoolers in the study. As a result, the null hypothesis (Ho), which presume that there is no significant relationship between home numeracy experiences and numeracy skills of preschoolers, is rejected. Based on the data gathered, it shows that numeracy activities and experiences that occur at home, such as counting games, number-related activities, and playing with number-based toys, have a significant impact on promoting children's early numeracy development, according to the significant relationship between home numeracy experiences and preschoolers' numeracy skills. Even though the correlation is weak, still it is significant enough to highlight the role of the home environment in shaping the fundamental numeracy skills of preschoolers.

CONCLUSION

Based on the aforementioned findings in the study, it is concluded that the Kindergarten pupils of Leyte Normal University – Integrated Laboratory School had shown a very high level of exposure to home numeracy experiences in terms of numeracy skill; high level of home numeracy experiences in terms of number books; and low level of home numeracy experiences in terms of games and applications-- indicating that these experiences is not frequently done at home. Meanwhile, the majority of the population has already reached an advanced level in numeracy skills, particularly in areas such as counting, identifying and writing numbers, recognizing attributes like colors, shapes, and sizes, as well as demonstrating critical thinking abilities. Furthermore, there is only one from the population who was categorized in the beginning level, indicating a very limited grasp of numeracy in terms of numeracy skills.

The above results could still be improved by increasing the preschoolers' level of exposure to home numeracy experiences specifically in the areas of games and application. Efforts to raise the kindergarteners' numeracy skills in all three domains of numbers, identifying attributes, and thinking skills could also be undertaken.

This study showed a significant, though weak, positive correlation between preschoolers' level of exposure to home numeracy experiences and their numeracy skills. A lot has also been said by experts about the importance of developing the math skills of children from a very young age, indicating that such efforts begin at home and continue alongside formal numeracy instruction in school.

RECCOMMENDATIONS

In light of the findings of this study, strengthening exposure to home numeracy experiences in order to further enhance the numeracy skills of preschoolers is strongly suggested. As an initial step, this researcher is proposing a numeracy skills enhancement plan as a prototype framework that educators and researchers in early childhood education can consider as they plan interventions for developing the numeracy skills of very young learners.

The conduct of next-step studies similar to this, but including more variables, using bigger samples, and employing other research designs and methodologies, could also be considered by future researchers.

CHAPTER 4

OUTPUT OF THE STUDY

This chapter covered the output of the study and provided an answer to the question as to what numeracy skills enhancement plan could be proposed to help teachers and parents strengthen the home numeracy experiences and number skills of preschoolers.

STRATEGIC INTERVENTION PLAN

Rationale

Early in life, numeracy lays the foundation of a child's future academic success and day-to-day problem-solving ability. Recent results from the study carried out at Leyte Normal University – Integrated Laboratory School (LNU-ILS), however shows that many preschoolers still exhibit

different degrees of numeracy proficiency despite strong formal instruction—particularly in areas needing the application of mathematical thinking at home.

This discrepancy may be traced to uneven exposure to home numeracy experiences, with some children getting very little exposure to games, number books, or practical math applications. Understanding that the home is an extension of the learning environment, it is essential that a support system extends beyond the classroom. According to LeFevre et al., 2009, for most children, acquisition and mastery of early numeracy skills occurs spontaneously through activities in the home and other experiences in the child's everyday environment. Thus, children's numeracy growth is significantly enhanced when formal schooling is reinforced with home-based activities guided by engaged parents or caregivers.

By creating a comprehensive and cooperative numeracy program that combines home and school numeracy activities, the numeracy skills strategic intervention plan seeks to close this gap. Anchored on theoretical and legal frameworks including Vygotsky's Zone of Proximal Development (ZPD), Piaget's Cognitive Development Theory, the Home Numeracy Model (LeFevre et al., 2010), DepEd Order No. 12, s. 2015 (Early Language, Literacy, and Numeracy Program), and Republic Act 10533 (Enhanced Basic Education Act of 2013), this plan seeks to empower both teachers and parents with tools and practices that cultivate stronger numeracy foundations in preschoolers. It is only a master plan, a general framework that individual schools, whether public or private, can adapt to suit their specific needs.

The ultimate goal is to ensure that all young learners have equal opportunities to develop early math skills. Along with math skills, teaching early math helps to support verbal, spatial and memory skills in young children which are crucial in all areas of life and academic success (Jordan et al., 2009). Therefore, it is important to build the foundation for future math learning early by reducing learning disparities and promoting inclusive, developmentally appropriate early childhood education.

Objectives

The numeracy skills strategic intervention plan has the general objective of improving the numeracy skills of preschool learners by enhancing their exposure to developmentally appropriate home-based numeracy experiences. The Plan outlines school-based activities that teachers and parents, with the support of the local government unit (LGU), can conduct so as to 1) increase parental involvement and understanding of their role in early numeracy development; 2) equip teachers with strategies, materials, and tools to support and monitor numeracy learning both in school and at home; and 3) ultimately develop inclusive, consistent, and sustainable approaches to integrating informal and formal numeracy practices across home and school environments.

Scheme of Implementation

The Numeracy Skills Strategic Intervention Plan, would include orientation and training for both teachers and parents, developing materials that are simultaneous and low-cost such as numeracy kits, providing numeracy activities and worksheets, and conducting of home visits or virtual meetings. The implementation plan will include multiple phases to ensure clarity, engagement, and sustained impact, which will help to cultivate and improve support for early numeracy foundation for young learners. In keeping with the main objectives of the research on home learning and preschool numeracy, the strategic intervention plan attempts to provide differentiated and developmentally appropriate numeracy activities and materials to promote and cultivate the foundation of early numeracy skills of preschoolers.

A copy of this intervention plan will be shared with the Leyte Normal University-Integrated Laboratory School leadership for consultation and refinement, prior to sharing with interested schools. The collaborative nature of the plan ensures that both school and family systems work together to cultivate numerate, confident, and engaged young learners.

Numeracy Skills Strategic Intervention Plan

Areas of Concern	Objectives	Strategies	Persons Involved	Budget	Source of Budget	Time Frame	Expected Outcome	Actual Accomplishment	Remarks
A. Strengthening Preschool Numeracy Skills	To enhance numeracy skills of preschool learners	Provide weekly printed numeracy activity sheets for home learning. Integrate hands-on number games into lessons and home tasks. Conduct assessment of learners' numeracy skill development quarterly.	Teachers, Parents, School Heads	10,000	School fund (GPTA and HRPTA), and LGU	S.Y. 2025–2026	Improved performance of learners in basic number recognition, counting, and problem-solving	Learners show increased scores in quarterly numeracy assessments	
B. Promoting Parental Engagement in Numeracy	To increase parental involvement in home numeracy practices	Conduct orientation and training sessions for parents. Create and distribute home learning guides and progress monitoring sheets. Hold regular feedback sessions with parents.	Teachers, Parents	5,000	School fund (GPTA and HRPTA), and LGU	July–August 2025	Parents actively support home numeracy activities and monitor learners' progress	Majority of parents attend orientations and submit weekly monitoring sheets	
C. Enhancing Teaching Resources and Methods	To equip teachers with effective materials and tracking methods for home learning	Develop localized numeracy kits using low-cost materials (e.g., bottle caps, flashcards). Train teachers in designing, implementing, and tracking home numeracy plans. Provide access to digital resources where available.	Teachers, Principal, Resource Developer	10,000	School fund (GPTA and HRPTA), and LGU	August–September 2025	Teachers implement structured home-based numeracy learning effectively	100% of teachers utilize numeracy kits and submit monthly implementation logs	
D. Monitoring and Evaluation of Numeracy Intervention	To ensure the effectiveness of the intervention program	Schedule monthly home visits or virtual check-ins. Collect and review learners' outputs. Analyze parent and teacher feedback data to adjust strategies as needed.	Teachers, Coordinators, School Head	5,000	School fund (GPTA and HRPTA), and LGU	September 2025–March 2026	Data-driven refinement of strategies and improved home-school collaboration	Monitoring reports and sample outputs collected monthly	
E. Promoting Play-Based Learning for Numeracy	To support informal numeracy learning through play	Encourage parents to use games like board games, collections, counting toys at home. Integrate real-life applications (e.g., shopping, cooking, calendars). Provide play-based numeracy ideas in newsletters or parent chats.	Teachers, Parents, Child Dev. Workers	10,000	School fund (GPTA and HRPTA), and LGU	Continuous (S.Y. 2025–2026)	Increased learner engagement and spontaneous use of numeracy skills in daily activities	Observation logs and parent reports show increase in play-based math learning	

BIBLIOGRAPHY

1. Aldemir, J., & Kermani, H. (2016). Integrated STEM curriculum: improving educational outcomes for Head Start children. *Early Child Development and Care*, *187*(11), 1694–1706. https://doi.org/10.1080/03004430.2016.1185102
2. Anders, Y., Rossbach, H., Weinert, S., Ebert, S., Kuger, S., Lehrl, S., & Von Maurice, J. (2012). Home and preschool learning environments and their relations to the development of early numeracy skills. *Early Childhood Research Quarterly*, *27*(2), 231–244. https://doi.org/10.1016/j.ecresq.2011.08.003
3. Aunio, P., Heiskari, P., Van Luit, J. E., & Vuorio, J. (2014). The development of early numeracy skills in kindergarten in low-, average- and high-performance groups. *Journal of Early Childhood Research*, *13*(1), 3–16. https://doi.org/10.1177/1476718x14538722
4. Clerkin, A., & Gilligan, K. (2018). Pre-school numeracy play as a predictor of children's attitudes towards mathematics at age 10. *Journal of Early Childhood Research*, *16*(3), 319–334. https://doi.org/10.1177/1476718x18762238
5. Davidse, N. J., De Jong, M. T., & Bus, A. G. (2013). Explaining common variance shared by early numeracy and literacy. *Reading and Writing*, *27*(4), 631–648. https://doi.org/10.1007/s11145-013-9465-0
6. Dowker, A. (2021). Home Numeracy and Preschool Children's Mathematical development: Expanding home numeracy models to include parental attitudes and emotions. *Frontiers in Education*, *6*. https://doi.org/10.3389/feduc.2021.575664
7. Elliott, L., Zheng, P., & Libertus, M. (2021). Individual differences in parental support for numeracy and literacy in early childhood. *Education Sciences*, *11*(9), 541. https://doi.org/10.3390/educsci11090541
8. Fuhs, M. W., ∗ & University of Dayton. (2020). Teacher fidelity to Conscious Discipline and children's executive function skills. In *Early Childhood Research Quarterly* (Vol. 51, pp. 14–25). https://doi.org/10.1016/j.ecresq.2019.08.003
9. Fuson, K. C., Clements, D. H., & Sarama, J. (2015). Making early math education work for all children. *Phi Delta Kappan*, *97*(3), 63–68. https://doi.org/10.1177/0031721715614831
10. Gaylord, S. M., O'Rear, C. D., Hornburg, C. B., & McNeil, N. M. (2018). Preferences for tactile and narrative counting books across parents with different education levels. *Early Childhood Research Quarterly*, *50*, 29–39. https://doi.org/10.1016/j.ecresq.2018.07.010

11. Ghazali, M., Mustafa, Z., Rabiatul-Adawiah, A. R., & Amzah, F. (2021). Parental involvement in young children's learning of numeracy. *International Journal of Learning Teaching and Educational Research*, *20*(1), 199–222. https://doi.org/10.26803/ijlter.20.1.11

12. Guhl, P. & Northwestern College. (2019). The impact of early math and numeracy skills on academic achievement in elementary school. In *Master's Theses & Capstone Projects Education* [Thesis]. https://nwcommons.nwciowa.edu/education_masters

13. Home literacy and numeracy environments in Asia. (n.d.). In *Frontiers in Psychology* (Vol. 12). https://doi.org/10.3389/fpsyg.2021.578764

14. Hornburg, C. B., Schmitt, S. A., & Purpura, D. J. (2018). Relations between preschoolers' mathematical language understanding and specific numeracy skills. *Journal of Experimental Child Psychology*, *176*, 84–100. https://doi.org/10.1016/j.jecp.2018.07.005

15. Jordan, N. C., Kaplan, D., Ramineni, C., & Locuniak, M. N. (2009). Early math matters: Kindergarten number competence and later mathematics outcomes. *Developmental Psychology*, *45*(3), 850–867. https://doi.org/10.1037/a0014939

16. LeFevre, J., Skwarchuk, S., Smith-Chant, B. L., Fast, L., Kamawar, D., & Bisanz, J. (2009). Home numeracy experiences and children's math performance in the early school years. *Canadian Journal of Behavioural Science/Revue Canadienne Des Sciences Du Comportement*, *41*(2), 55–66. https://doi.org/10.1037/a0014532

17. Napoli, A. R., & Purpura, D. J. (2017). The home literacy and numeracy environment in preschool: Cross-domain relations of parent–child practices and child outcomes. *Journal of Experimental Child Psychology*, *166*, 581–603. https://doi.org/10.1016/j.jecp.2017.10.002

18. Petropoulou, A., Lavidas, K., & Papadakis, S. (2024). Investigation of Preschoolers' Mathematical Skills: A Systematic Literature review. *Educational Process International Journal*, *13*(2). https://doi.org/10.22521/edupij.2024.132.3

19. Ribner, A. D., Willoughby, M. T., & Blair, C. B. (2017). Executive Function Buffers the Association between Early Math and Later Academic Skills. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.00869

20. Salminen, J., Khanolainen, D., Koponen, T., Torppa, M., & Lerkkanen, M. (2021). Development of Numeracy and Literacy Skills in Early Childhood—A longitudinal study on the roles of home environment and familial risk for reading and math difficulties. *Frontiers in Education*, *6*. https://doi.org/10.3389/feduc.2021.725337

21. Samantha J. Sepulveda. (2019). Language intervention research in early childhood care and education: A systematic survey of the literature. *Early Childhood Research Quarterly*. https://doi.org/10.1016/j.ecresq.2019.02.010

22. Silinskas, G., Di Lonardo, S., Douglas, H., Xu, C., LeFevre, J., Garckija, R., Gabrialaviciute, I., & Raiziene, S. (2020).Responsive home numeracy as children progress from kindergarten through Grade 1. *Early Childhood Research Quarterly*, *53*, 484–495. https://doi.org/10.1016/j.ecresq.2020.06.003

23. Silinskas, G., Di Lonardo, S., Douglas, H., Xu, C., LeFevre, J.-A., Garckija, R., Gabrialaviciute, I., Raiziene, S., Department of Psychology, University of Jyväskylä, Finland, Department of Cognitive Science, Carleton University, Canada, Department of Psychology, Carleton University, Canada, & Institute of Psychology, Mykolas Romeris University, Lithuania. (n.d.). Responsive home numeracy as children progress from kindergarten through Grade 1. In *Early Childhood Research Quarterly* (Vol. 53, pp. 484–495). https://doi.org/10.1016/j.ecresq.2020.06.003

24. Skwarchuk, S., Sowinski, C., & LeFevre, J. (2014). Formal and informal home learning activities in relation to children's early numeracy and literacy skills: The development of a home numeracy

model. *Journal of Experimental Child Psychology*, *121*, 63–84. https://doi.org/10.1016/j.jecp.2013.11.006

25. Soto-Calvo, E., Simmons, F. R., Adams, A., Francis, H. N., & Giofre, D. (2019). Pre-Schoolers' Home Numeracy and Home Literacy Experiences and Their Relationships with Early Number Skills: Evidence from a UK Study. *Early Education and Development*, *31*(1), 113–136. https://doi.org/10.1080/10409289.2019.1617012
26. Susperreguy, M. I., Di Lonardo Burr, S., Xu, C., Douglas, H., & LeFevre, J. (2020). Children's Home Numeracy Environment Predicts Growth of their Early Mathematical Skills in Kindergarten. *Child Development*, *91*(5), 1663–1680. https://doi.org/10.1111/cdev.13353
27. Susperreguy, M. I., Douglas, H., Xu, C., Molina-Rojas, N., & LeFevre, J. (2018). Expanding the Home Numeracy Model to Chilean children: Relations among parental expectations, attitudes, activities, and children's mathematical outcomes. *Early Childhood Research Quarterly*, *50*, 16–28. https://doi.org/10.1016/j.ecresq.2018.06.010