British Journal of Teacher Education and Pedagogy
ISSN: 2755-1482
DOI: 10.32996/bjtep
Journal Homepage: www.al-kindipublisher.com/index.php/bjtep

Home Numeracy Environment and Mathematics Proficiency of Early Grade Learners Based on Rapid Mathematics Assessment (RMA) Results

Maria Bregente ✉[1], **Maribel Dalanon**[1], **Cheralyn Yee**[1]

[1] *Department of Education, Philippines*

Corresponding Author: Maria Bregente**, E-mail:** mariaalcano583@gmail.com

ABSTRACT

This study assessed the Home Numeracy Environment and mathematics proficiency of Grade 1 learners based on their Rapid Mathematics Assessment (RMA) results as a basis for developing a Home Numeracy and Mathematics Support Program. A quantitative descriptive–correlational research design was employed at Labangon Elementary School, Cebu City, during School Year 2026–2027. Purposive sampling was used to select the participating sections, followed by total enumeration involving 70 Grade 1 learners from Sections Cyan and Red and their respective parents or guardians. Data were gathered using a demographic profile sheet, an adapted Home Numeracy Environment Questionnaire, and official RMA performance records. Frequency counts, percentages, weighted means, standard deviations, mean percentage scores, and Spearman's rank-order correlation coefficient were utilized for data analysis. Findings revealed favorable home numeracy practices, particularly in parental expectations, encouragement, and formal numeracy activities. However, informal numeracy activities and numeracy resources received comparatively lower ratings, while learners demonstrated insufficient proficiency across all assessed mathematics competencies. The relationships between home numeracy dimensions and overall RMA performance were not statistically significant. The study concluded that favorable home numeracy practices alone did not adequately explain variations in mathematics proficiency. Consequently, the adoption and implementation of the proposed Home Numeracy and Mathematics Support Program were strongly recommended to strengthen foundational numeracy through targeted remediation, parental guidance, and home–school collaboration.

KEYWORDS

Home Numeracy Environment, foundational numeracy, mathematics proficiency, formal numeracy activities, informal numeracy activities

ARTICLE INFORMATION

ACCEPTED: 15 October 2026 **PUBLISHED:** 15 November 2026 **DOI:** 10.32996/bjtep.2026.5.11.1

1. Introduction

Foundational numeracy played a vital role in children's academic development, as early mathematical knowledge supported reasoning, problem-solving, and subsequent achievement in mathematics (Chen, 2025). Children's mathematical development was influenced not only by classroom instruction but also by learning experiences provided at home (Zhao & Gibson, 2023). Daucourt et al. (2021) found a significant positive relationship between the home mathematics environment and mathematics achievement. Similarly, James-Brabham et al. (2025), in a meta-analysis involving 72 samples across 20 countries, reported a small but significant association between home mathematics activities and young children's mathematical skills. These findings emphasized the importance of examining the Home Numeracy Environment (HNE) during the early primary years.

Globally, inadequate foundational numeracy remained a significant educational challenge. UNICEF (2022) reported that only approximately 18% of Grade 3 children in half of the low- and middle-income countries examined demonstrated the expected foundational numeracy skills. UNESCO (2024) likewise reported that only 44% of learners worldwide achieved minimum mathematics proficiency by the end of primary education. Trickett et al. (2023) further found that specific number-related play activities were associated with children's mathematical skills, highlighting the relevance of varied home numeracy experiences. In the Philippines, the Programme for International Student Assessment (PISA) 2022 revealed that only 16% of Filipino learners attained at least Level 2 proficiency in mathematics, compared with the OECD average of 69% (OECD, 2023). Although the assessment involved older learners, the findings reflected broader challenges in mathematics education. Meanwhile, the Southeast

Copyright: © 2026 the Author(s). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) 4.0 license (https://creativecommons.org/licenses/by/4.0/). Published by Al-Kindi Centre for Research and Development, London, United Kingdom.

Asia Primary Learning Metrics (SEA-PLM) 2024 reported an improvement in Grade 5 mathematics proficiency, with the proportion of Filipino learners reaching higher proficiency levels increasing from 17% in 2019 to 26% in 2024 (Acoba, 2026). Nevertheless, learning disparities persisted, emphasizing the importance of early assessment and intervention through the Department of Education's Rapid Mathematics Assessment (RMA).

At the local level, the Beginning-of-School-Year RMA2 results of 37 Grade 1–Cyan learners at Labangon Elementary School during School Year 2026–2027 revealed substantial difficulties in foundational mathematics. Eight learners were classified as Emerging–Not Proficient, 26 as Emerging–Low Proficient, and only three as Developing–Nearly Proficient. None attained the Proficient or Highly Proficient classifications. The learners obtained an average score of approximately 10.95 out of 35, equivalent to 31.3%, indicating substantial gaps in essential mathematical competencies. These findings highlighted the need to examine the home-based numeracy activities, parental encouragement, and learning resources that could have been associated with learners' mathematics performance.

The study was aligned with Sustainable Development Goal 4 (SDG 4), which emphasized inclusive, equitable, and quality education and the attainment of essential learning competencies. It also reflected UNICEF's emphasis on foundational learning and family engagement as important components of children's educational development. These priorities reinforced the importance of examining the home environment alongside school-based mathematics instruction.

Despite growing research on early numeracy, findings regarding the relationship between home mathematics practices and children's mathematical achievement remained varied. Cosso et al. (2023) found that parental mathematics anxiety influenced the association between the Home Numeracy Environment and children's mathematics skills, while James-Brabham et al. (2025) reported considerable differences across studies. Furthermore, existing investigations had largely focused on preschool populations or educational settings outside the Philippines. Few school-based studies had examined formal numeracy activities, informal numeracy activities, parental expectations and encouragement, and numeracy resources alongside competency-specific RMA performance among Grade 1 learners in Cebu City. This gap established the need for a contextualized investigation of the Home Numeracy Environment and mathematics proficiency.

Accordingly, the study aimed to assess the Home Numeracy Environment and mathematics proficiency of Grade 1 learners at Labangon Elementary School during School Year 2026–2027 based on their RMA results. Specifically, it examined the demographic profile of parent respondents, assessed the four dimensions of the Home Numeracy Environment, determined learners' performance across the assessed mathematics competencies, and investigated the relationships between home numeracy experiences and mathematics proficiency. The findings served as the empirical basis for developing a contextualized Home Numeracy and Mathematics Support Program designed to address identified learning difficulties, strengthen parental involvement, and promote meaningful home–school collaboration.

2. Literature Review

The Home Numeracy Environment refers to the mathematical experiences, practices, expectations, and resources available to children within the home (Alam & Dubé, 2023). These experiences may be formal, such as practicing number writing, counting, addition, and subtraction, or informal, such as using mathematics during play, shopping, cooking, measurement, and conversations involving numbers (Humphreys & Parker, 2023). Alam and Dubé (2023) found that parental expectations and involvement in digital home numeracy practices were associated with children's mathematics knowledge across numeration, operations, patterns, spatial concepts, and problem solving. Elliott et al. (2023) likewise showed that different types of home number activities were associated with different mathematical skills, supporting the view that the Home Numeracy Environment is multidimensional. Cosso et al. (2023) further demonstrated that parental mathematics anxiety can influence the relationship between home numeracy experiences and children's mathematical skills. Leyva et al. (2023) reported that family mathematics interventions embedded in everyday routines increased parents' mathematics talk and home mathematics activities. Mak et al. (2024) also found that parental numeracy expectations were positively related to home numeracy activities, highlighting the importance of parental encouragement and expectations. These findings support examining formal numeracy activities, informal numeracy activities, parental expectations and encouragement, and numeracy resources as distinct dimensions of the home learning environment.

Mathematics proficiency in Grade 1 involves the development of several interconnected competencies, including number recognition, counting and ordering, fractions, addition, subtraction, two-dimensional shapes, repeating patterns, time and calendar concepts, and non-standard measurement of length. Early weaknesses in these areas may affect later mathematical learning because foundational concepts support more complex reasoning and problem solving. Girard et al. (2025) found that a randomized home numeracy intervention produced positive effects on children's transcoding and ordering skills, showing that structured parent–child activities can strengthen specific mathematical competencies. James-Brabham et al. (2025), in a meta-analysis of 72 samples across 20 countries, reported a small but significant positive relationship between home mathematics activities and young children's mathematical skills. Elia et al. (2023) emphasized that early mathematics development is strengthened when children encounter sequenced learning experiences that build knowledge of numbers, operations, geometry, patterning, and measurement. Purpura et al. (2019) highlighted the importance of foundational numerical and mathematical language competencies in supporting children's early mathematics achievement. Similarly, Zippert and Rittle-Johnson (2022) showed that young children benefit from meaningful mathematical interactions that connect concepts with everyday experiences. Collectively, these studies

support assessing Grade 1 learners through competency-specific measures such as the Rapid Mathematics Assessment and examining how home numeracy experiences may be associated with differences in overall mathematics proficiency.

3. Methodology

The study employed a quantitative descriptive-correlational research design to assess the Home Numeracy Environment and mathematics proficiency of Grade 1 learners at Labangon Elementary School during School Year 2026–2027. The descriptive component examined the parent respondents' demographic profile, the Home Numeracy Environment in terms of formal numeracy activities, informal numeracy activities, parental expectations and encouragement, and numeracy resources, as well as learners' mathematics proficiency based on Rapid Mathematics Assessment results. The correlational component examined the relationships between the Home Numeracy Environment dimensions and learners' overall RMA performance.

The respondents consisted of 70 Grade 1 learners from Sections Cyan and Red and their respective parents or legal guardians. Purposive sampling was used to select the two sections, followed by total enumeration of all eligible participants. The study utilized a three-part instrument composed of a demographic profile sheet, an adapted 20-item Home Numeracy Environment Questionnaire, and the learners' official RMA performance records. The RMA covered number recognition, counting and ordering, fractions, addition, subtraction, two-dimensional shapes, repeating patterns, time and calendar concepts, and non-standard measurement of length. Before data collection, the researchers secured the necessary institutional and school permissions and observed ethical requirements, including informed consent, learner assent, confidentiality, and compliance with the Data Privacy Act of 2012. Respondent codes were used to match parent responses with learner RMA records while protecting identities. Data were checked, encoded, organized, and analyzed using frequency counts, percentages, weighted means, standard deviations, mean scores, and mean percentage scores. Spearman's rank-order correlation coefficient was employed to determine the strength, direction, and significance of the relationships between the four Home Numeracy Environment dimensions and overall RMA performance at the 0.05 level of significance. The findings served as the basis for developing a proposed Home Numeracy and Mathematics Support Program.

4. Results

Table 1. Formal Numeracy Activities

Statements	Mean	SD	Verbal Description
I ask the child to count objects found at home.	4.40	0.77	Strongly Agree
I help the child practice reading and writing numbers.	4.61	0.60	Strongly Agree
I ask the child simple addition or subtraction questions.	4.51	0.61	Strongly Agree
I help the child compare which group has more or fewer objects.	4.33	0.72	Strongly Agree
I practice number facts with the child.	4.50	0.68	Strongly Agree
Overall Mean and SD	4.47	0.53	Strongly Agree

Table 1 showed that formal numeracy activities received a rating of Strongly Agree, with an overall mean of 4.47 and an SD of 0.53, showing that parents consistently engaged children in structured mathematics activities at home. The highest-rated indicator was helping the child practice reading and writing numbers, with a mean of 4.61, followed by asking simple addition or subtraction questions at 4.51. The lowest-rated indicator was helping the child compare groups with more or fewer objects, with a mean of 4.33. These findings imply that parents provide strong support for basic numerical skills. However, more emphasis should be given to quantity comparison activities to strengthen number sense, reasoning, and readiness for more complex mathematical concepts.

Table 2. Informal Numeracy Activities

Statements	Mean	SD	Verbal Description
The child plays board games or card games that involve counting.	3.76	1.08	Agree
The child uses money during play or simple buying activities.	3.74	1.14	Agree

Statements	Mean	SD	Verbal Description
The child helps measure ingredients, length, time, or quantity.	3.49	1.10	Agree
We talk about numbers seen in daily life, such as prices, dates, and house numbers.	4.04	0.98	Agree
The child uses number puzzles, blocks, or counting materials.	4.11	0.84	Agree
Overall Mean and SD	3.83	0.75	Agree

Table 2 showed that informal numeracy activities received a rating of Agree, with an overall mean of 3.83 and an SD of 0.75, showing that children generally engaged in everyday mathematics experiences at home. The highest-rated indicator was using number puzzles, blocks, or counting materials, with a mean of 4.11, followed by discussing numbers encountered in daily life at 4.04. The lowest-rated indicator was helping measure ingredients, length, time, or quantity, with a mean of 3.49. These findings imply that informal numeracy opportunities are present but can still be strengthened. Parents should be encouraged to involve children more frequently in practical measurement, money use, games, and household activities to develop mathematical understanding through meaningful real-life experiences.

Table 3. Parental Expectations and Encouragement

Statements	Mean	SD	Verbal Description
I expect the child to count correctly within the level appropriate for Grade 1.	4.66	0.56	Strongly Agree
I expect the child to solve simple addition and subtraction problems.	4.60	0.52	Strongly Agree
I encourage the child to explain how an answer was found.	4.47	0.70	Strongly Agree
I praise the child for effort in mathematics activities.	4.61	0.57	Strongly Agree
I encourage the child to keep trying when a mathematics task is difficult.	4.66	0.51	Strongly Agree
Overall Mean and SD	4.60	0.43	Strongly Agree

The results indicate that informal numeracy activities received a rating of Agree, with an overall mean of 3.83 and an SD of 0.75, showing that children generally engaged in everyday mathematics experiences at home. The highest-rated indicator was using number puzzles, blocks, or counting materials, with a mean of 4.11, followed by discussing numbers encountered in daily life at 4.04. The lowest-rated indicator was helping measure ingredients, length, time, or quantity, with a mean of 3.49. These findings imply that informal numeracy opportunities are present but can still be strengthened. Parents should be encouraged to involve children more frequently in practical measurement, money use, games, and household activities to develop mathematical understanding through meaningful real-life experiences.

Table 4. Numeracy Resources

Statements	Mean	SD	Verbal Description
I provide books that include numbers, counting, or simple mathematics.	4.31	0.77	Strongly Agree
I provide number cards, flash cards, or similar learning materials.	4.16	0.85	Agree
I provide board games or card games that involve numbers.	3.96	1.00	Agree

Statements	Mean	SD	Verbal Description
I provide blocks, counters, coins, or objects for mathematics practice.	4.21	0.88	Strongly Agree
I allow the child to use appropriate digital mathematics learning activities.	4.26	0.92	Strongly Agree
Overall Mean and SD	4.18	0.69	Agree

The results indicate that numeracy resources received a rating of Agree, with an overall mean of 4.18 and an SD of 0.69, showing that parents generally provided learning materials and opportunities that support mathematics learning at home. The highest-rated indicator was providing books that include numbers, counting, or simple mathematics, with a mean of 4.31, followed by allowing appropriate digital mathematics learning activities at 4.26. The lowest-rated indicator was providing board games or card games involving numbers, with a mean of 3.96. These findings imply that numeracy resources are generally available, but game-based materials can still be strengthened. Providing more affordable number games and hands-on resources may increase children's engagement and support the development of foundational mathematical skills.

Table 5. Grade 1 RMA Performance by Learning Area

Learning Area	Mean Score	Maximum Score	Mean Percentage	Proficiency Rating
Number Recognition, Counting and Ordering	4.09	8	51.07%	Not Proficient
Fractions	0.96	2	47.86%	Not Proficient
Addition	3.79	8	47.32%	Not Proficient
Subtraction	2.83	6	47.14%	Not Proficient
Two-Dimensional Shapes	1.89	4	47.14%	Not Proficient
Repeating Patterns	0.47	1	47.14%	Not Proficient
Time and Calendar Concepts	1.41	3	47.14%	Not Proficient
Non-standard Measurement of Length	1.41	3	47.14%	Not Proficient
Overall	16.84	35	48.12%	Not Proficient

Legend: 95%–100% = Highly Proficient (HP), Ready for Enrichment Activities; 85%–94% = Proficient (P), Ready for Consolidation Exercises; 75%–84% = Nearly Proficient (NP), Requires Targeted Practice; 60%–74% = Low Proficient (LP), Requires Intensive Intervention; Below 60% = Not Proficient (NPr), Requires Immediate Remediation.

Table 5 showed that Grade 1 learners were classified as Not Proficient across all assessed RMA learning areas, with an overall mean score of 16.84 out of 35 and a mean percentage of 48.12%. The highest performance was recorded in number recognition, counting, and ordering at 51.07%, followed by fractions at 47.86% and addition at 47.32%. Subtraction, two-dimensional shapes, repeating patterns, time and calendar concepts, and non-standard measurement of length each obtained 47.14%. These findings imply that learners have substantial gaps in foundational mathematics competencies. Immediate remediation and targeted instructional support are therefore necessary, particularly through structured practice, concrete materials, repeated exposure, and home–school activities that strengthen number sense, operations, patterns, shapes, measurement, and time concepts.

Table 6. Relationship Between Home Numeracy and Overall RMA Scores

Home Numeracy Dimension	Spearman rho	p-value	Decision	Remarks
Formal Numeracy Activities	0.034	0.780	Not Significant	Fail to Reject H_0
Informal Numeracy Activities	0.125	0.304	Not Significant	Fail to Reject H_0
Parental Expectations and Encouragement	0.106	0.382	Not Significant	Fail to Reject H_0
Numeracy Resources	0.088	0.467	Not Significant	Fail to Reject H_0

Significant at $p < 0.05$.

The results indicate that none of the Home Numeracy Environment dimensions had a statistically significant relationship with the learners' overall RMA scores at the 0.05 level of significance. Formal numeracy activities showed a negligible positive relationship ($\rho = 0.034$, $p = 0.780$), while informal numeracy activities showed the highest correlation ($\rho = 0.125$, $p = 0.304$), although it remained weak and non-significant. Parental expectations and encouragement ($\rho = 0.106$, $p = 0.382$) and numeracy resources ($\rho = 0.088$, $p = 0.467$) likewise showed negligible positive relationships. Since all p-values were greater than 0.05, the null hypotheses were not rejected. These findings imply that variations in home numeracy experiences were not significantly associated with RMA performance in this sample, suggesting that other factors such as classroom instruction, learner readiness, attendance, and individual learning needs may also contribute to mathematics proficiency.

5. Discussion

The findings show that the Home Numeracy Environment of the Grade 1 learners was generally favorable, particularly in formal numeracy activities and parental expectations and encouragement. Parents frequently supported structured mathematics learning through counting, number reading and writing, basic operations, and practice of number facts. They also demonstrated strong expectations for mathematics performance and encouraged children to persist when tasks were difficult. Informal numeracy activities and numeracy resources were also present, although these areas were comparatively less evident. Practical measurement activities, money-related experiences, board games, card games, and other hands-on numeracy opportunities received lower ratings than structured activities. This pattern suggests that parents may be more comfortable providing direct academic practice than embedding mathematics in everyday routines. Strengthening informal and resource-based learning may therefore help children experience mathematics in more meaningful, practical, and engaging ways at home.

Despite the generally supportive Home Numeracy Environment, the learners' RMA results revealed substantial difficulties across all assessed mathematics competencies. Their overall performance was classified as Not Proficient, with weaknesses evident in number recognition and ordering, fractions, addition, subtraction, shapes, patterns, time and calendar concepts, and non-standard measurement. Moreover, none of the four Home Numeracy Environment dimensions showed a statistically significant relationship with overall RMA performance. This indicates that, within this group, differences in home numeracy experiences were not strongly associated with differences in mathematics proficiency. The findings suggest that home support alone may be insufficient to address the learners' foundational mathematics gaps. Other factors, such as classroom instruction, individual readiness, attendance, prior learning experiences, and the intensity of remediation, may also influence achievement. Therefore, coordinated home–school intervention is needed to strengthen both structured and practical numeracy learning.

6. Conclusion

Based on the findings, it was concluded that the Home Numeracy Environment of Grade 1 learners was generally favorable, particularly in parental expectations, encouragement, and formal numeracy activities. However, despite positive parental support, the learners demonstrated insufficient mastery of foundational mathematics competencies based on their Rapid Mathematics Assessment (RMA) results. The hypothesis testing suggested that home numeracy dimensions alone did not adequately explain variations in mathematics proficiency. These findings emphasized the importance of providing quality, relevant, and developmentally appropriate learning experiences. In professional practice, the results highlighted the need for differentiated instruction, targeted remediation, continuous assessment, and stronger parent–teacher collaboration.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

References

Alam, S. S., & Dubé, A. K. (2023). How does the modern home environment impact children's mathematics knowledge? Evidence from Canadian elementary children's digital home numeracy practice (DHNP). Journal of Computer Assisted Learning, 39(4), 1211–1241. https://doi.org/10.1111/jcal.12795

ACOBA, R. (2026). Bridging the Mathematics Learning Crisis in Philippine Basic Education: Evidence-Based Policy Directions for Improving Numeracy and Mathematical Proficiency. CED POLICY BRIEF, 1(1).

Chen, W. (2025). Problem-solving skills, memory power, and early childhood mathematics: Understanding the significance of the early childhood mathematics in an individual's life. Journal of the Knowledge Economy, 16(1), 1–25.

Cosso, J., Finders, J. K., Duncan, R. J., Schmitt, S. A., & Purpura, D. J. (2023). The home numeracy environment and children's math skills: The moderating role of parents' math anxiety. Journal of Experimental Child Psychology, 227, 105578. https://doi.org/10.1016/j.jecp.2022.105578

Elia, I., Baccaglini-Frank, A., Levenson, E., Matsuo, N., Feza, N., & Lisarelli, G. (2023). Early childhood mathematics education research: Overview of latest developments and looking ahead. Annales de Didactique et de Sciences Cognitives. Revue internationale de didactique des mathématiques, 28, 75–129.

Elliott, L., Votruba-Drzal, E., Miller, P., Libertus, M. E., & Bachman, H. J. (2023). Unpacking the home numeracy environment: Examining dimensions of number activities in early childhood. Early Childhood Research Quarterly, 62, 129–138. https://doi.org/10.1016/j.ecresq.2022.08.002

Girard, C., De Lamper, A., Callens, S., Van den Broek, D., & De Smedt, B. (2025). Causal effects of an ecologically valid home numeracy intervention on preschoolers' numeracy skills. Child Development, 96(6), 1917–1933. https://doi.org/10.1111/cdev.70010

Humphreys, C., & Parker, R. (2023). Making number talks matter: Developing mathematical practices and deepening understanding, grades 3-10. Routledge.

James-Brabham, E., von Bastian, C. C., Brough, C., & Blakey, E. (2025). Do home mathematical activities relate to early mathematical skills? A systematic review and meta-analysis. Child Development, 96(1), 451–468. https://doi.org/10.1111/cdev.14162

Leyva, D., Libertus, M. E., & McGregor, R. (2023). Math intervention targeting family routines increases parental math talk and math activities. Journal of Applied Developmental Psychology, 89, 101595. https://doi.org/10.1016/j.appdev.2023.101595

Mak, C., Tang, J., & Chan, W. W. L. (2024). The importance of home numeracy environment in preschoolers' spontaneous focusing on numerosity: A mediation study. Early Childhood Research Quarterly, 68, 45–53. https://doi.org/10.1016/j.ecresq.2024.04.002

Purpura, D. J., Napoli, A. R., & King, Y. (2019). Development of mathematical language in preschool and its role in learning numeracy skills. In Cognitive foundations for improving mathematical learning (pp. 175–193). Academic Press.

Trickett, J., Batchelor, S., Brittle, B., Foulkes, M., Pickering, J., Slocombe, F., & Gilmore, C. (2022). The role of parent-led and child-led home numeracy activities in early mathematical skills. Cognitive Development, 63, 101189.

Zhao, Y. V., & Gibson, J. L. (2023). Early home learning support and home mathematics environment as predictors of children's mathematical skills between age 4 and 6: A longitudinal analysis using video observations and survey data. Child Development, 94(6), e377-e392.