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Profiling the Cognitive Readiness of Selected Kindergarten Learners with Undernutrition Status in Bulacao Community School: A Case Study

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Abstract:

This descriptive cross-sectional case study evaluated the cognitive readiness of 14 selected undernourished kindergarten learners at Bulacao Community School during School Year 2026–2027. Employing a convergent parallel mixed-methods design, the study integrated quantitative secondary records and qualitative field data to profile baseline nutritional status, pre- and post-assessment literacy and numeracy (LitNum) proficiency, developmental progress across seven Early Childhood Care and Development (ECCD) domains, and lived learning experiences described by teachers and parents. Participants were purposively selected based on DepEd BMI-for-age classification as wasted. Quantitative analysis used frequency, percentage, mean, standard deviation, Exact McNemar Test for LitNum proficiency change, and Wilcoxon Signed-Rank Test with Holm adjustment for ECCD domain scores. Qualitative data from classroom observations and semi-structured interviews with three kindergarten teachers and 14 parents underwent six-phase thematic analysis following Braun and Clarke. Results showed 100% prevalence of wasting, confirming acute undernutrition as a universal physiological constraint. Literacy proficiency shifted markedly from 92.9% Beginning in pre-assessment to 78.6% Developing in post-assessment ($p = .0010$, significant), while numeracy showed positive but non-significant movement ($p = .1250$) due to higher baseline (50% already Consistent). ECCD profiling revealed initial delays in Self-Help (64.3% below Average, including 14.3% Significant Delay) and Expressive Language (57.1% Slight Delay). Post-assessment, all domains reached Average with no Significant Delay; Self-Help ($p = .0147$) and Cognitive ($p = .0182$) showed statistically significant improvement. Qualitative convergence indicated low stamina, attention fluctuation, and energy dips linked to irregular eating, accommodated by teachers through shortened 15–20 minute modules, visual aids, and differentiated small-group phonics, while parents reinforced learning with household objects (coins, utensils, pebbles, snacks). Persistent challenges included phonetic blending, expressive language confidence, and limited home resources. The study proposes an Institutionalized Nutritional, Developmental, and Learning Readiness Monitoring Program (INDLRMP) integrating quarterly BMI tracking, ECCD checks, LitNum diagnostics, targeted interventions, and home-school coordination for sustainable early childhood support.

Keywords: cognitive readiness, undernutrition, kindergarten, LITNUM, ECCD, Bulacao Community School

Introduction:

Early Childhood Education (ECE) is universally recognized as the foundational stage for lifelong learning, establishing critical trajectories for cognitive, socio-emotional, and physical development. Investments in quality ECE during the formative years of 4 to 6 years old yield disproportionate returns in school readiness, executive function, and later academic efficiency. In the Philippine context, kindergarten is mandated as compulsory entry to basic education under Republic Act No. 10157, yet the realization of its developmental promise is contingent upon addressing persistent health barriers, chief among them childhood undernutrition. Undernutrition remains a dual public health and educational crisis, impairing not only physical growth but also neural connectivity, processing speed,

working memory, and attention regulation necessary for early learning.

According to the World Health Organization (2023), undernutrition contributes to delayed cognitive development, poor school readiness, and reduced productivity. Wasting, defined as low weight-for-height, reflects acute nutritional deficit that manifests in classroom contexts as lethargy, irritability, short attention span, and reduced task persistence. In the Philippines, the Enhanced Basic Education Information System reports approximately 13.2% of assessed learners as stunted or wasted, with kindergarten showing heightened vulnerability. To mitigate this, Republic Act No. 11037 (Masustansyang Pagkain para sa Batang Pilipino Act) institutionalizes the School-Based Feeding Program (SBFP) for undernourished learners from Kindergarten to Grade 6, providing 120 feeding days of fortified meals and milk. National evaluations indicate reduction of combined severely wasted and wasted prevalence from 32% to 22%, with kindergarten exhibiting +27.2 percentage points improvement, yet academic variability persists.

At Bulacao Community School, Barangay Bulacao, Cebu City, a school established in 1966 serving 7,262 sqm catchment, preliminary observations in School Year 2026–2027 identified several kindergarten pupils classified as wasted who exhibited difficulties sustaining attention, participating actively, following multi-step instructions, and completing literacy and numeracy tasks. While SBFP is implemented, the link between nutritional status and classroom cognitive readiness remains insufficiently explored beyond anthropometric recovery. Existing local studies by Canillo and Alferez (2025) and Cubio (2025) documented improved BMI and attendance post-feeding, but Macarandan and Hussien (2024) argued that nutritional improvement alone does not fully explain academic outcomes, necessitating exploration of developmental and pedagogical factors.

This study is anchored on three sequential theories. Maslow's Hierarchy of Needs (1943) posits physiological needs as prerequisites for cognitive engagement; a hungry child prioritizes biological maintenance over higher-order learning. Piaget's Cognitive Development Theory (1952) situates kindergarten learners in the Preoperational Stage, where symbolic thought, language acquisition, and intuitive problem-solving depend on active environmental interaction, disrupted when energy is depleted. Bronfenbrenner's Bioecological Systems Theory (1979, 2006) situates learning within microsystem (home, classroom) and mesosystem (parent-teacher interaction) processes. Legal anchors RA 11037 and DepEd Orders 036 s.2019, 031 s.2021, and 038 s.2022 provide policy mandate for integrated health and learning monitoring.

The purpose of this study is to profile cognitive readiness of 14 selected undernourished kindergarten learners at Bulacao Community School using a convergent mixed-methods case study, examining nutritional status, LitNum proficiency, ECCD domain development, and qualitative descriptions of learning experiences, to propose an Institutionalized Nutritional, Developmental, and Learning Readiness Monitoring Program (INDLRMP). This addresses gap between feeding program implementation and classroom cognitive support, offering data-driven, context-responsive intervention bridging health tracking and early literacy and numeracy instruction.

Literature Review:

ECCD Multi-Domain Development. Empirical evaluations highlight distinct developmental trajectories. Cañete (2023) in Philippine center-based programs observed high mastery in cognitive and receptive language but persistent need for scaffolding in self-help and expressive language, echoing pre-assessment findings of this study where Self-Help showed 64.3% below Average. SEAMEO CECCEP (2022) regional review confirmed structured center activities accelerate cognitive readiness, yet motor regulation depends on individualized support. Conjares (2021) noted early integrated services buffer cognitive and socio-emotional domains but gaps in peri-urban public schools create disparities. These highlight that average performance in gross motor and receptive language may mask specific vulnerabilities in self-care and expressive communication, requiring domain-specific intervention rather than global readiness scores.

Play-Based Pedagogy. Reyes and Bautista (2021) demonstrated structured play enhances peer interaction, cooperation, and emotional regulation. Tuncdemir (2021) established imaginative cooperative play strengthens problem-solving and empathy. UNESCO (2021) found play-centered curricula produce higher school readiness than rigid teacher-directed approaches. In undernourished contexts where stamina is limited, play-based, movement-integrated short modules are particularly salient to sustain engagement without overtaxing energy reserves, a strategy

teachers in this study adopted via sensory breaks and shortened activities.

Parental Engagement. Gudio (2022) reported home reading, storytelling, and conversational engagement significantly enhance cognitive preparedness. World Bank (2021) identified parent-child book sharing and interactive play as strong predictors of early cognitive and language development in low- and middle-income countries. Conjares (2021) emphasized parental involvement as moderator maximizing benefits of ECCD and feeding interventions. In this study, parents using coins, utensils, pebbles, toys, and snacks as counting manipulatives exemplify low-cost home learning environment adaptations, yet time constraints and limited books were barriers, indicating need for structured parent guidance.

Anthropometric Status and Biological Impact. Anthropometric indicators—Weight-for-Age (WAZ), Height-for-Age (HAZ), Weight-for-Height (WHZ)—categorize stunting, wasting, and underweight (EDCOM II, 2023). DepEd Order 010 s.2024 mandates systematic nutritional tracking at school entry. Awaludin et al. (2020) meta-analysis established chronic growth deficits disrupt neural connectivity, lowering processing speed, working memory, and executive function. EDCOM II (2023) documented acute undernutrition causes daily lethargy, short attention spans, elevated absenteeism. Ali et al. (2025) meta-analysis across low- and middle-income countries reported acute undernutrition associated with poorer cognitive and language development, supporting need for combined health-learning monitoring. Dulal et al. (2021) systematic review found integrated nutrition plus early stimulation interventions show potential to improve nutritional and developmental outcomes, providing evidence base for INDLRMP's dual-track approach. Kirolos et al. (2022) systematic review of neurodevelopmental impairments post-malnutrition highlighted persisting deficits in cognition, behavior, and mental health, underscoring that single feeding cycle may be insufficient for full cognitive recovery.

School-Based Feeding and Institutionalization. EDCOM II (2023) demonstrated institutionalized feeding under RA 11037 yields immediate gains in attendance, stamina, participation. Conjares (2021) confirmed health monitoring plus micronutrient supplementation restores physical growth over time. Canillo and Alferez (2025) found SBFP significantly improved nutritional status, concentration, academic performance after six months. Cubio (2025) reported positive contribution to educational outcomes. However, Morcoso (2025) and Santos et al. (2024) observed learners still demonstrate cognitive learning needs—lethargy, delayed speech processing, reduced attention—requiring pedagogical strategies alongside meals. Omand et al. (2021) prospective cohort showed early nutritional risk increases likelihood of developmental delays across cognitive, language, executive readiness in kindergarten, establishing predictive link. This justifies moving from standalone feeding to institutionalized monitoring where BMI, ECCD, and LitNum are tracked together.

Literacy and Numeracy Trajectories. Emergent literacy encompasses phonemic awareness, alphabet knowledge, vocabulary, comprehension. Villamor (2021) evaluation of early grade reading in Philippines showed targeted language interventions yield significant improvements among at-risk readers. ACTRC (2022) Philippines ECCD longitudinal study revealed systematic phonics and print-rich environment enable rapid transition from letter recognition to basic comprehension, relevant to observed shift from 92.9% Beginning to 78.6% Developing in this study's literacy profile. Tracking baseline profiles isolates lingering deficits early in Key Stage 1.

Early numeracy involves number identification, counting, quantity comparison, elementary problem-solving. Clements and Sarama (2021) learning trajectories approach shows concrete manipulatives drive gains in number sense and spatial reasoning. In this study, numeracy as relative strength (50% already Consistent pre-assessment) aligns with home practices embedding counting in daily chores, explaining non-significant statistical gain ($p=.1250$) despite improvement of 4 learners from Beginning.

Interdependence of Literacy and Numeracy. Villamor (2021) established positive correlation between language comprehension and mathematical problem-solving; vocabulary needed to process word problems. SEAMEO INNOTECH (2021) demonstrated vocabulary acquisition enhances numerical reasoning in kindergarten. ACTRC (2022) revealed reading decoding deficits correspond to parallel bottlenecks in basic arithmetic. This interdependence supports integrated literacy-numeracy intervention rather than isolated skill drilling, particularly for learners with limited expressive language (57.1% Slight Delay pre-assessment). Thus literature converges on need for multi-

dimensional program combining nutritional tracking, developmental scaffolding, and integrated LitNum support with home-school collaboration.

Methodology:

Research Design

The study employed a convergent parallel mixed-methods research design to evaluate nutritional status, cognitive performance, and developmental outcomes of selected Kindergarten learners with undernutrition at Bulacao Community School during SY 2026–2027. Quantitative strand addressed measurable profiles and statistical relationships using official DepEd secondary records: descriptive statistics (frequency, percentage, mean, SD) for BMI-for-age, LitNum diagnostic levels, and Philippine ECCD checklist seven domains. Inferential tools: Exact McNemar Test (paired nominal change in LitNum proficiency Beginning vs higher) and Wilcoxon Signed-Rank Test with Holm adjustment for ECCD domain median scores. Qualitative strand addressed lived experiences via contextual observations, document reviews of school-based feeding logs, and semi-structured interviews with teachers and parents, analyzed via Braun and Clarke (2006) six-phase thematic analysis. Integration occurred at interpretation using Joint Display Matrix for triangulation: convergence, expansion, complementarity.

Research Locale

Conducted at Bulacao Community School, Barangay Bulacao, Cebu City, Division of Cebu City, 7 km from city proper, land area ~7,262 sqm. Established May 19, 1966. School implements SBFP, health initiatives, stakeholder collaboration. Preliminary observations noted undernourished kindergarten pupils struggled with attention, participation, instruction-following, task completion. Unaddressed gaps risk persistent academic underachievement, dropout.

Participants and Sampling

Participants: 14 kindergarten learners with undernutrition status enrolled SY 2026–2027, 14 parents/guardians, 3 kindergarten teachers, total 31 key informants. Distribution: Kinder A 6 learners (43%), Kinder B 1 (7%), Kinder C 7 (50%). Purposive sampling based on baseline BMI nutritional assessment: Wasted or Severely Wasted per SBFP classification. Inclusion criteria learners: officially enrolled kindergarten at Bulacao, identified undernourished via school nutritional assessment, with written parental informed consent and child assent, regularly attending. Teachers: directly handling selected pupils, willing to interview. Parents: primary caregiver knowledgeable about health, nutrition, routines, home learning, voluntary participation. Exclusion: pupils without consent, non-attending. Sample size aligns with Creswell and Poth (2018) and Yin (2018): qualitative case study seeks depth via multiple sources rather than statistical representativeness; data collection continued until saturation.

Instruments

Secondary Data: School Nutritional Assessment Records (BMI-for-age), LitNum Assessment Results (literacy: letter recognition, phonemic awareness, comprehension; numeracy: number recognition, counting, quantity, simple operations), ECCD Checklist (DepEd Order 47 s.2016). Semi-Structured Interview Guides: separate for teacher (classroom observations, participation, attention, communication, learning behaviors, developmental concerns, challenges) and parents (health practices, home learning environment, daily routines, support). Guides developed from Statement of Problem, theoretical framework, literature, reviewed by adviser and expert validators.

Data Gathering Procedure

Four phases. Pre-Gathering: secured approval from Schools Division Superintendent (Dr. Nimfa D. Bongo), school head (Mr. Marcial D. Termoso Jr.), coordinated with kindergarten teachers on schedules, obtained informed consent (Cebuano/Visayan translation) and child assent, validated guides. During: reviewed nutritional records to identify eligible learners, obtained LitNum and ECCD records as secondary data, conducted semi-structured interviews 30–45 minutes at convenient time/place, audio-recorded with permission, conducted classroom observations. Post-

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Gathering: transcribed verbatim, organized observation notes and secondary data, coded. Data Analysis Preparation: encrypted files, pseudonymized (Pupil A, Parent B, Teacher C).

Data Analysis

Quantitative: frequency counts for categorical classifications, percentage distributions relative to total, mean for central tendency across sub-domains, SD for dispersion. Qualitative: Phase 1 familiarization (repeated reading transcripts, notes, reflective memos), Phase 2 initial codes (manifestations of cognitive readiness, influencing factors, challenges), Phase 3 searching themes (grouping codes), Phase 4 reviewing themes (checking against dataset, merging/refining), Phase 5 defining/naming (central meaning, contribution to research questions), Phase 6 producing report (supported by excerpts, interpreted via theoretical framework). Triangulation: Data Source Triangulation (records, teacher, parents, observation) and Methodological Triangulation (quantitative + qualitative). Integration via Joint Display Matrix.

Ethical Considerations

Strict adherence: Beneficence (maximize benefit via data-driven intervention plan, minimize harm via non-intrusive embedded observations avoiding labeling), Respect for Human Dignity (parental informed consent, verbal child assent child-friendly, voluntary withdrawal without penalty or loss of feeding benefits), Justice and Fairness (fair selection based strictly on objective BMI records), Transparency (clear communication objectives, procedures, scope in local language). Confidentiality: direct identifiers removed, code names, locked storage physical notes, encrypted password-protected electronic files, retention per institutional policy then destruction. Risks minimal, mitigated by private parent interviews, avoiding public discussion health status. No conflict of interest declared. Debriefing: summary findings presented constructively to school heads, teachers, parents focusing strengths, needs, collaboration.

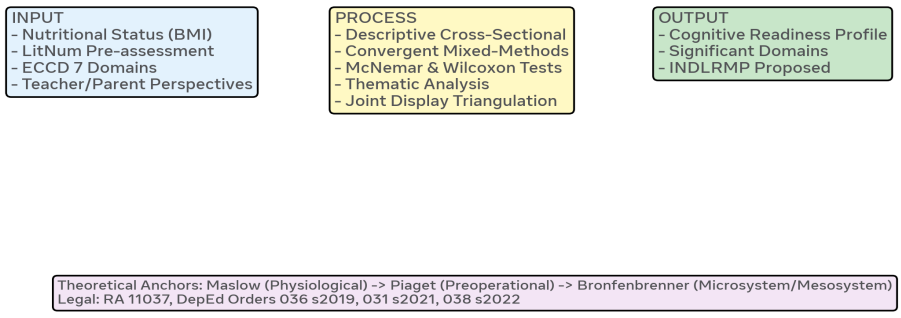
Results and Discussion:

This chapter presents presentation, analysis, and interpretation of data organized by research questions, integrating tables, figures, graphs, and diagram. Discussion triangulates quantitative statistical outcomes with qualitative thematic insights and related literature.

Flow and Conceptual Framework

Figure 1 illustrates Input-Process-Output model guiding study. Input includes nutritional status, LitNum, ECCD profiles, teacher-parent perspectives. Process encompasses convergent mixed-methods, statistical testing (McNemar, Wilcoxon), thematic analysis, triangulation. Output is cognitive readiness profile and INDLRMP. Theoretical matrix: Maslow establishes physiological prerequisite, Piaget explains preoperational internal mechanisms, Bronfenbrenner provides bioecological surrounding framework.

Figure: IPO Model & Theoretical Framework



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1. Nutritional Status of the Learners

Table 2 presents nutritional status of 14 selected kindergarten learners. Findings show all 14 learners (100.0%) classified as wasted, 0.0% severely wasted. Indicates acute undernutrition as universal constraint within selected group, not representative of all kindergarten learners. This baseline is critical context for examining cognitive readiness, literacy and numeracy proficiency, developmental outcomes. Recent literature emphasizes relationship between undernutrition and development: Ali et al. (2025) reported acute undernutrition among children in low- and middle-income countries associated with poorer cognitive and language development. Dulal et al. (2021) found integrated interventions combining nutrition and early stimulation showed potential to improve outcomes. EDCOM II (2023) documented wasting causes daily lethargy, short attention, absenteeism. Thus 100% prevalence highlights need for regular monitoring and school-home support, basis for institutionalized program.

Nutritional Status	Frequency	Percentage (%)
Wasted	14	100.0
Severely Wasted	0	0.0
Total	14	100.0

2. Pre- and Post-Assessment LitNum Profiles

2.1 Literacy Proficiency. Table 3 presents pre-post literacy levels of 14 learners. Pre: 13 learners (92.9%) Beginning, 0 Developing, 1 (7.1%) Consistent. Post: 2 (14.3%) Beginning, 11 (78.6%) Developing, 1 (7.1%) Consistent. Distribution indicates notable shift from Beginning toward Developing. Specifically, 11 of 13 initially Beginning progressed to Developing, 2 remained Beginning. Consistent learner maintained level. Pattern suggests improved literacy between assessments. Relevant to cognitive readiness indicator. Need continuous developmentally appropriate literacy activities, especially for 2 remaining Beginning. Literature: Villamor (2021) targeted interventions improve at-risk readers; ACTRC (2022) structured phonics enables rapid transition. This supports that repeated practice, visual aids, storytelling contributed. However, nutritional status does not causally explain change, descriptive design limitation.

Level	Pre (f)	Pre (%)	Post (f)	Post (%)
Beginning	13	92.9	2	14.3
Developing	0	0.0	11	78.6
Consistent	1	7.1	1	7.1
Total	14	100.0	14	100.0

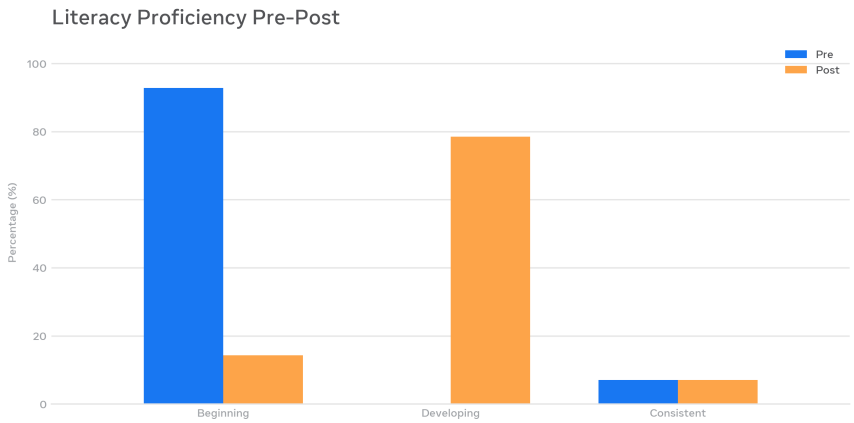


Figure 2: Literacy Proficiency Pre-Post Comparison. Visual shows dramatic reduction in Beginning and increase in Developing.

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2.2 Numeracy Proficiency. Table 4 presents numeracy. Pre: 5 (35.7%) Beginning, 2 (14.3%) Developing, 7 (50.0%) Consistent. Post: 1 (7.1%) Beginning, 6 (42.9%) Developing, 7 (50.0%) Consistent. Positive shift: 4 of 5 Beginning moved higher, only 1 remained Beginning. Developing increased from 2 to 6. Half maintained Consistent across assessments, indicating concentration at Developing and Consistent. Numeracy as indicator of cognitive readiness. Sustain developmentally appropriate numeracy while supporting remaining Beginning learner, and reinforce Consistent learners with extension activities. Literature: Clements and Sarama (2021) concrete manipulatives drive number sense; parents' use household objects aligns. Ali et al. (2025) and Dulal et al. (2021) support monitoring nutrition together with learning indicators, but cannot establish causality. Overall post-assessment most learners Developing or Consistent, basis for continued instruction and periodic assessment within proposed monitoring program.

Level	Pre (f)	Pre (%)	Post (f)	Post (%)
Beginning	5	35.7	1	7.1
Developing	2	14.3	6	42.9
Consistent	7	50.0	7	50.0
Total	14	100.0	14	100.0

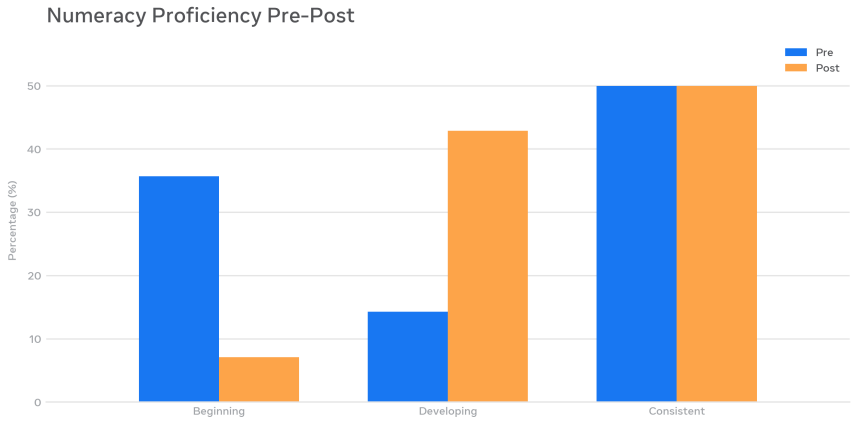


Figure 3: Numeracy Proficiency Pre-Post Comparison shows stability in Consistent group and movement from Beginning to Developing.

3. Pre- and Post-Assessment ECCD Results

Table 5 Pre-Assessment ECCD Profile across seven domains. All learners Average in Gross Motor (14,100%) and Receptive Language (14,100%). Most Average in Fine Motor (12,85.7%), Cognitive (13,92.9%), Social-Emotional (12,85.7%). However Self-Help showed greatest variation: 2 (14.3%) Significant Delay, 7 (50.0%) Slight Delay, only 5 (35.7%) Average. Expressive Language: 8 (57.1%) Slight Delay, 6 (42.9%) Average. Two learners Slightly Advanced Fine Motor (14.3%), one Cognitive (7.1%). Findings indicate generally Average performance in several domains pre-assessment, but Self-Help and Expressive Language requiring attention. 9 learners (64.3%) below Average Self-Help, more than half Slight Delay Expressive Language. Need targeted developmental activities strengthening independence daily tasks and expressive communication. ECCD domains provide information about communication, independence, cognitive functioning. Dulal et al. (2021) integrated interventions may support developmental outcomes. Ali et al. (2025) association acute undernutrition and developmental outcomes. Findings support monitoring nutrition together with developmental progress, but not causal.

Domain	Significant Delay	Slight Delay	Average	Slightly Advanced
Gross Motor	-	-	14 (100%)	-
Fine Motor	-	-	12 (85.7%)	2 (14.3%)
Self-Help	2 (14.3%)	7 (50%)	5 (35.7%)	-

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Receptive Language	-	-	14 (100%)	-
Expressive Language	-	8 (57.1%)	6 (42.9%)	-
Cognitive	-	-	13 (92.9%)	1 (7.1%)
Social-Emotional	-	2 (14.3%)	12 (85.7%)	-

Table 6 Post-Assessment ECCD Developmental Profile. All Average Gross Motor (14,100%) and Receptive Language (14,100%). Majority Average Fine Motor (11,78.6%), Cognitive (12,85.7%), Social-Emotional (13,92.9%). Self-Help: 13 (92.9%) Average, 1 (7.1%) Slight Delay. Expressive Language: 8 (57.1%) Average, 6 (42.9%) Slight Delay. Two Slightly Advanced Cognitive (14.3%), three Slightly Advanced Fine Motor (21.4%). Compared with pre, more favorable distribution. Most notable change Self-Help: Average increased from 5 (35.7%) to 13 (92.9%), two Significant Delay and five Slight Delay no longer in those categories. Expressive Language Average increased from 6 (42.9%) to 8 (57.1%), Slight Delay decreased 8 to 6. Fine Motor Average 85.7% to 78.6% reflects increase Slightly Advanced 14.3% to 21.4%. Post-assessment learners generally Average across all seven domains, no Significant Delay. Nevertheless Expressive Language remains area requiring continued attention, 6 learners (42.9%) still Slight Delay, suggests need continued oral expression, conversation, storytelling, vocabulary activities. Findings consistent with importance continuous developmental monitoring and responsive early childhood support. Dulal et al. (2021) combining nutritional interventions with early childhood stimulation. Ali et al. (2025) association. Reinforce relevance monitoring nutrition and development together, particularly among undernutrition. However observed changes should not be interpreted as evidence nutritional status caused improvement, descriptive selected group 14 learners. Overall post-assessment shows Average performance across domains, substantial improvement Self-Help and more favorable Expressive Language, continued monitoring recommended particularly Slight Delay learners to ensure emerging needs identified promptly.

Domain	**Significant Delay**	**Slight Delay**	**Average**	**Slightly Advanced**
Gross Motor	-	-	14 (100%)	-
Fine Motor	-	-	11 (78.6%)	3 (21.4%)
Self-Help	-	1 (7.1%)	13 (92.9%)	-
Receptive Language	-	-	14 (100%)	-
Expressive Language	-	6 (42.9%)	8 (57.1%)	-
Cognitive	-	-	12 (85.7%)	2 (14.3%)
Social-Emotional	-	1 (7.1%)	13 (92.9%)	-

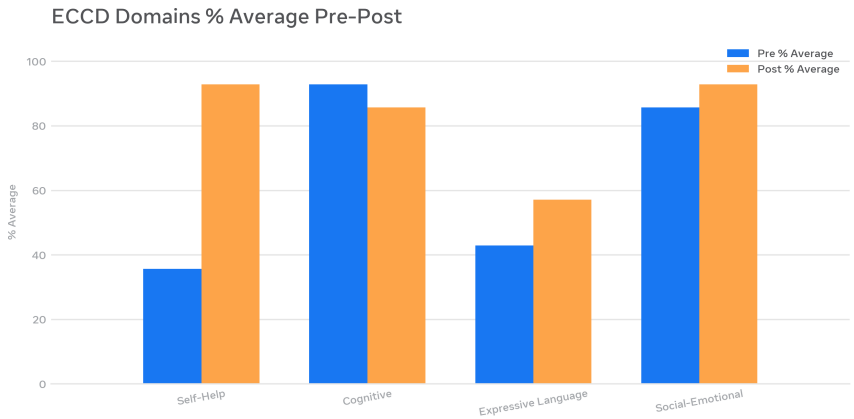


Figure 4: ECCD % Average Pre-Post shows Self-Help dramatic gain from 35.7% to 92.9% Average.

4. Significant Difference Pre-Post LitNum

Table 7 Exact McNemar Test for Pre-Post LITNUM Proficiency. Literacy: 11 learners improved from Beginning to higher proficiency, none declined, Exact McNemar p-value .0010 Significant at p<.05, null hypothesis rejected. Numeracy: 4 improved from Beginning to higher, none declined, exact p .1250 exceeded .05, null not rejected. Findings support sustained literacy interventions and continued numeracy reinforcement to consolidate and extend observed gains. Interpretation: literacy improvement statistically meaningful reflecting notable improvements in letter recognition, early language acquisition despite lingering challenges phonetic blending, sentence comprehension. Numeracy gains not significant primarily due high initial baseline performance fostered by daily practical math exposure at home (parents using coins, utensils). This aligns with Villamor (2021) and ACTRC (2022) that baseline matters; high initial Consistent 50% creates ceiling effect reducing McNemar power with n=14.

LITNUM	Improved	Declined	p-value	Interpretation	Decision
Literacy	11	0	.0010*	Significant	Reject H0
Numeracy	4	0	.1250	Not Significant	Fail to Reject H0

5. Significant Difference ECCD Domains

Table 8 Wilcoxon Signed-Rank Test for Pre-Post ECCD Domain Scores. Gross Motor Pre Median 13.00 (IQR 0.00) Post 13.00 (0.00) W 0.00 p 1.0000 Holm-adjusted 1.0000 Not Significant. Fine Motor 10.50 (1.00) to 11.00 (0.00) p .0384 unadjusted but .1922 Holm-adjusted Not Significant. Self-Help 21.00 (2.50) to 24.00 (1.50) W 0.00 p .0021 Holm .0147 Significant. Receptive Language 4.00 (1.00) to 5.00 (1.00) p .1573 Holm .4719 Not Significant. Expressive Language 7.00 (0.00) to 7.00 (1.00) p .0833 Holm .3331 Not Significant. Cognitive 17.50 (2.00) to 19.00 (1.00) p .0030 Holm .0182 Significant. Social-Emotional 20.00 (1.75) to 20.00 (1.00) p .1573 Holm .4719 Not Significant. Findings indicate varying levels change across seven domains. After Holm adjustment, statistically significant improvements observed in Self-Help (p=.0147) and Cognitive (p=.0182) with higher median scores post-assessment. Meanwhile other domains did not show significant changes (p>.05). Most evident developmental progress occurred in self-help and cognitive functioning. Continued developmental activities important to maintain gains and strengthen other domains. Discussion: Self-Help improvement from 64.3% below Average to 92.9% Average reflects growing personal independence, self-care routines supported by school routines and parental assistance. Cognitive significant gain aligns with improved problem-solving readiness, symbolic recall during daily activities. Non-significant Gross Motor and Receptive Language due to ceiling: 100% already Average pre, no variance to improve. Fine Motor p .0384 unadjusted suggests trend but not survive Holm correction, indicating need larger sample. Expressive Language persistent slight delay 42.9% post highlights speech confidence, vocabulary development require longer sustained home-school language interventions beyond one school year, consistent with Cañete (2023) expressive language requiring targeted scaffolding.

Domain	Pre Median (IQR)	Post Median (IQR)	W	Unadjusted p	Holm-adjusted p	Decision
Gross Motor	13.00 (0.00)	13.00 (0.00)	0.00	1.0000	1.0000	Not Significant
Fine Motor	10.50 (1.00)	11.00 (0.00)	0.00	.0384	.1922	Not Significant
Self-Help	21.00 (2.50)	24.00 (1.50)	0.00	.0021	.0147	Significant
Receptive Language	4.00 (1.00)	5.00 (1.00)	0.00	.1573	.4719	Not Significant
Expressive Language	7.00 (0.00)	7.00 (1.00)	0.00	.0833	.3331	Not Significant
Cognitive	17.50 (2.00)	19.00 (1.00)	0.00	.0030	.0182	Significant
Social-Emotional	20.00 (1.75)	20.00 (1.00)	0.00	.1573	.4719	Not Significant

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6. Teachers' and Parents' Descriptions of Cognitive Readiness

The interview responses of teachers and parents revealed varied learning experiences among 14 learners. Organized into five major areas: (1) literacy and numeracy readiness and difficulties, (2) perceived factors, (3) health/nutrition/stamina/engagement, (4) learning support school/home, (5) challenges.

Literacy and Numeracy Readiness and Difficulties. Theme 1: Difficulties in Foundational Literacy Skills. Teachers and parents consistently described difficulties foundational literacy among several learners: letter recognition, letter-sound association, phonetic blending, pronunciation, sight-word recognition, writing, reading fluency, comprehension. Learners B, C, D, F, H, I, J, K, L, M, N described experiencing at least one difficulty early literacy. Most recurring concerns blending sounds, recognizing/recalling letters and sounds, reading unfamiliar words. Parent Learner B: difficulty blending consonant-vowel sounds into full words. Parent Learner N: difficulty comprehending meaning complete sentences. Learner E basic difficulties remembering letter names sounds. Learner J difficulty tracing writing weak pencil control. Accounts suggest literacy readiness uneven, some progressed Developing, several continued requiring structured support foundational phonological, letter recognition, writing, comprehension. Aligns with quantitative 14.3% remaining Beginning.

Theme 2: Differences Foundational Numeracy Readiness. Participants described numeracy as relative strength several learners, though difficulties remained lower proficiency. Common concerns recognizing printed numbers, remembering sequences, connecting numbers quantities, counting beyond familiar ranges, performing simple addition/subtraction, moving concrete to abstract. Learners B, C, D, H, M, N strong/consistent numeracy performance. Parents commonly reported counting household objects, coins, toys, utensils, other familiar materials as learning activities at home. In contrast Learners E and G difficulties number recognition, counting, connecting spoken numbers quantities. Learners F, J, K, L also difficulties basic operations, number writing, sequencing, matching numerals quantities. Responses indicate learners benefited concrete familiar materials when developing numeracy concepts. Parents reported using toys, snacks, pebbles, spoons, buttons, blocks, coins to support counting basic mathematical activities. This explains higher baseline Consistent 50% and non-significant McNemar: home daily math exposure.

Theme 3: Emerging Improvement Learning Readiness. Teachers parents described observable progress literacy and numeracy among many learners, consistent quantitative assessment movement Beginning to Developing. Learners B, C, D, F, H, J, K, L, M, N described showing progress literacy, numeracy, or both. Accounts attributed progress to repeated practice, structured activities, hands-on learning, positive reinforcement, classroom participation, continued support home. Several learners described becoming more confident, attentive, willing participate as familiarity learning tasks gained. However progress not uniform. Learners E and G continued substantial difficulties both literacy numeracy, indicating need differentiated instruction individualized support based each learner demonstrated readiness, consistent with 14.3% Beginning literacy and 7.1% Beginning numeracy remaining.

Factors Perceived to Relate to Cognitive Readiness. Theme 1: Learner Engagement, Motivation, Learning Preferences. Differences motivation, attention, confidence, preferred ways learning. Some highly motivated, independent, eager complete tasks, Learners A, B, K, M. Others easily distracted, hesitant, shy, reluctant participate, particularly literacy activities. Responses showed learners responded differently instructional approaches. Some preferred visual materials flashcards, charts, picture-word cards. Others responded better hands-on activities, physical objects, games, movement, songs, play-based learning. Positive reinforcement verbal praise frequently identified helpful sustaining participation. Accounts suggest learner engagement and preferred learning approaches important considerations supporting cognitive readiness, aligns with Piaget preoperational active engagement and Bronfenbrenner microsystem proximal processes.

Theme 2: Home Learning Environment and Parental Support. Home-based support important part learning experiences. Parents reported setting study schedules, reading stories, practicing letters numbers, preparing homemade learning materials, incorporating literacy numeracy into daily household activities. Examples coins counting, kitchen utensils number activities, storybooks reading, household objects sorting counting. Several parents also provided direct guidance encouragement during learning sessions. However differences availability learning resources and time for home instruction. Some parents difficulty finding sufficient time because household responsibilities work, others

limited access books learning materials. This aligns with World Bank (2021) home learning environment predictor, and Gudio (2022) parent stimulating activities influence school preparedness. Suggests intervention must include low-cost material provision and parent workshops.

Health, Nutrition, Stamina, Learning Engagement. Theme 1: Physical Stamina and Energy During Learning. Recurring pattern description low physical stamina, fatigue, reduced energy several learners. Parents teachers described learners becoming tired during extended activities, energy dips later day, requiring breaks between tasks. Learners A, B, C, D, F, H, I, J, K, L, M, N described experiencing some fatigue, low energy, physical tiredness. Learner E frequently lacking energy difficulty sustaining activities, Learner G easily exhausted. Suggests physical stamina important consideration classroom home learning experiences. Teachers responded adjusting activity duration, incorporating breaks, using shorter more active learning tasks when appropriate. Direct convergence with quantitative 100% wasted classification, Maslow physiological needs overriding cognitive engagement, Omand et al. (2021) nutritional risk developmental delays.

Theme 2: Eating Habits and Perceived Learning Experiences. Parents teachers also described eating habits nutritional concerns part daily learning experiences. Several learners described poor appetite, picky eating, skipped meals, low energy associated eating patterns. Parents Learners B, D, G, H, K others described reduced appetite irregular eating coinciding lower energy learning activities. Learner J described becoming irritable unfocused when hungry benefiting regular snacks before studying. Highlights importance considering nutrition eating patterns when planning learning developmental support. However interview responses represent perceptions experiences reported teachers parents not interpreted as establishing direct causal relationship between nutritional status and cognitive readiness.

Learning Support Provided School and Home. Theme 1: Differentiated and Developmentally Responsive School Support. Teachers described using varied strategies address individual learning needs: phonics instruction, small-group reading activities, differentiated tasks, hands-on learning, visual aids, movement-based activities, frequent breaks, repetition, individualized remediation. For learners stronger numeracy weaker literacy, teachers provided additional literacy activities while continuing challenging numeracy tasks. For learners difficulties both areas, teachers simplified tasks, provided one-on-one assistance, used concrete materials support understanding. Indicates teachers adjusted instruction according demonstrated proficiency, attention span, interests, learning needs, consistent with Bronfenbrenner mesosystem action.

Theme 2: Home-Based Practice and Positive Reinforcement. Parents provided learning support through daily regular practice home: reading together, tracing letters, counting household objects, practicing phonics, reviewing worksheets, using flashcards, incorporating learning into household routines. Parents also reported using positive reinforcement, praise, playtime, songs, interactive activities encourage participation. Several parents created homemade learning materials when commercially available resources limited. Convergence school home support suggests repeated practice across learning environments provided learners additional opportunities reinforce foundational skills, consistent with Ansari et al. (2022) quality interactions across microsystems predict cognitive readiness.

Challenges Encountered. Theme 1: Individual Learning Difficulties and Sustaining Attention. Teachers parents identified several challenges supporting learners persistent foundational difficulties: short attention spans, difficulty retaining previously learned information, hesitation answering, weak pencil control, difficulty phonetic blending, challenges understanding abstract concepts. Learners who remained Beginning level required more intensive individualized support. Teachers also described challenge balancing individual remediation with learning needs entire class. Findings indicate need differentiated activities sufficiently structured address foundational gaps while remaining appropriate developmental levels.

Theme 2: Limited Time, Resources, Parental Capacity. Parents reported practical challenges providing consistent learning support home: limited time because work household responsibilities, scarcity books practice materials, difficulty obtaining native-language learning resources, uncertainty appropriate strategies addressing persistent learning difficulties. Parent Learner E expressed difficulty knowing how effectively address learner struggles, other parents reported challenges maintaining attention, preparing learning materials, providing uninterrupted study time. Suggests strengthening school-home coordination may help parents access appropriate learning strategies materials. Parent guidance particularly useful learners requiring continued support foundational literacy, numeracy,

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developmental skills. This supports contingency plan for program sustainability leveraging Barangay Health Center, LGU Nutrition Councils, NGOs Adopt-a-School Program for supplementary resources.

7. Data Triangulation and Mixed-Methods Integration

To ensure methodological rigor, credibility, empirical validity, study employs Data Source Triangulation cross-analyzing quantitative diagnostic records, teacher interviews, parent interviews, field observations. Methodological Triangulation integrating quantitative metrics with qualitative thematic findings. Merging datasets through Joint Display Matrix during analytical stage allows quantitative metrics establish objective extent nutritional and learning deficits, while qualitative data explains how conditions influence daily learning experiences. Table 9 presents integration. Quantitative records strongly converge with qualitative interview accounts regarding baseline energy levels, nutritional constraints, academic progression. 100.0% prevalence wasting recorded official physical assessments directly corresponds with reports both teachers and parents describing pupil lethargy, rapid physical fatigue, low stamina during extended activities, irritability linked irregular eating habits. Furthermore statistically significant pre-to-post improvement literacy proficiency (p=.0010) alongside significant gains ECCD Self-Help (p=.0147) and Cognitive (p=.0182) directly aligns qualitative accounts emerging learner confidence, improved classroom participation, enhanced self-care independence over time. Qualitative interview findings expand quantitative assessment results by explaining how undernourished learners achieved significant developmental academic progress. While post-assessment metrics indicate 78.6% learners reached Developing level literacy and 92.9% attained Average functioning Self-Help, numerical scores alone do not reveal instructional mechanisms behind improvements. Interview responses show teachers accommodated low physical stamina shortening task durations, scheduling frequent breaks, utilizing small-group differentiated instruction. Concurrently parents reinforced learning home incorporating tangible household items, such as coins, utensils, buttons, snacks, as concrete math manipulatives and conducting short structured reading sessions. Degree analytical nuance emerges when examining Exact McNemar test numeracy proficiency (p=.1250) and non-significant ECCD domain changes (Gross Motor, Fine Motor, Expressive Language). Lack statistical significance numeracy does not indicate lack student ability, but reflects fact half learners (50.0%) already benchmarked Consistent level during pre-assessment. Qualitative data clarifies numeracy was area relative strength many children because parents routinely integrated counting daily household chores. Similarly persistent slight delays Expressive Language (42.9% post-assessment) highlight while physical stamina cognitive engagement improved, speech confidence vocabulary development require longer sustained home-school language interventions.

Research Dimension	Quantitative Metrics	Qualitative Findings	Triangulation Outcome
Nutritional Status & Cognitive Energy	100% Wasted; 0% Severely Wasted	Teachers: exhausted, energy dips, frequent breaks; Parents: poor appetites, skipped meals	Convergence: BMI aligns with low stamina fatigue
Foundational Literacy	Pre 92.9% Beg, Post 78.6% Dev; p=.0010 Significant	Teachers: difficulties blending, pencil control overcome via small-group phonics; Parents: tracing, storytelling, visual aids	Convergence & Expansion: Gains reflect progress; reveals mechanisms phonics, visual aids, home practice
Foundational Numeracy	Pre 35.7% Beg, 50% Cons; Post 7.1% Beg, 42.9% Dev; p=.1250 NS	Teachers: relative strength though low learners struggle; Parents: use household objects coins spoons pebbles	Convergence & Expansion: Higher baseline explains non-significant; concrete manipulatives explain strength
ECCD Performance	Pre high delays Self-Help 64.3% below Avg, Exp Lang 57.1% delay; Post Self-Help p=.0147	Teachers: weak pencil control, speech hesitation, short attention; Parents: assist	Convergence & Expansion: Post gains Self-Help Cognitive converge with

	Cog p=.0182 sig, 100% Avg Gross Motor Receptive	self-care, encourage oral participation	independence confidence reports

8. Proposed Program INDLRMP

Based on integrated findings, Institutionalized Nutritional, Developmental, and Learning Readiness Monitoring Program (INDLRMP) proposed as output. Phased implementation: Phase 1 Screening Baseline Profiling start school year: comprehensive height, weight, BMI, ECCD checklist, LITNUM diagnostic, consolidated Individual INDLRMP Learner Cards. Phase 2 Targeted Interventions Direct Support first through fourth quarter: undernourished learners integrated SBFP, clinical referrals local health units, teachers embed sensory motor socio-emotional activities, small-group individualized remediation for Beginning level. Phase 3 Periodic Reassessment Home-School Coordination throughout academic year: quarterly parent-teacher conferences progress updates, structured home-based learning nutrition strategies, monitoring records updated, mid-year reassessments nutrition, development, literacy, numeracy. Phase 4 Post-Assessment Program Evaluation end school year: comprehensive post-evaluations physical health, developmental domains, academic skills, consolidation accomplishment data, review implementation records, best practices operational challenges, formal Program Evaluation Report guiding continuous improvement. Contingency sustainability: constrained MOOE, leverage inter-agency partnerships Barangay Health Center co-utilize child health tracking tools micronutrient supplies medical personnel quarterly assessments, LGU City Barangay Nutrition Councils tap health nutrition funds, NGOs civic groups alumni Adopt-a-School Program donations learning manipulatives printed assessment materials nutritional supplements. Table 10 presents matrix areas concern objectives strategies persons involved budget source timeframe expected outcome.

Conclusion:

The assessment of selected kindergarten learners at Bulacao Community School established 100.0% prevalence of wasted nutritional status, serving as primary constraint on physical stamina and learning engagement, confirming Maslow's physiological prerequisite premise and recent evidence by Omand et al. (2021) and Ali et al. (2025) that acute undernutrition impairs cognitive energy and executive function. Despite this, post-assessment evaluations demonstrated significant literacy proficiency gains from 92.9% Beginning to 78.6% Developing ($p = .0010$) alongside notable developmental progress in Self-Help ($p = .0147$) and Cognitive ($p = .0182$) domains, whereas numeracy proficiency and other developmental areas maintained higher baseline standings without statistically significant shifts, reflecting ceiling effects and home-embedded math practices. Quantitative shifts converge with qualitative reports of low physical stamina, short attention spans, rapid energy depletion, yet emerging improvement attributed to teacher accommodations—shortened 15–20 minute modules, sensory breaks, visual aids, phonics scaffolding—and parent reinforcement using tangible household objects as concrete manipulatives.

Persistent gaps remain: 14.3% learners still Beginning literacy, 42.9% Slight Delay Expressive Language, challenges phonetic blending, pencil control, speech confidence requiring longer sustained language interventions. These integrated findings confirm undernourished learners exhibit emerging cognitive readiness but require structured, multi-dimensional support beyond feeding alone, consistent with Morcoso (2025) and Dulal et al. (2021) integrated nutrition plus stimulation.

Consequently outcomes provide clear empirical basis for Institutionalized Nutritional, Developmental, and Learning Readiness Monitoring Program (INDLRMP) to systematically integrate quarterly BMI tracking with ECCD domain checks and LitNum diagnostic profiling, embedding health tracking into classroom management. INDLRMP's four-phase cycle—screening, targeted interventions, periodic reassessment and home-school coordination, post-assessment evaluation—addresses identified biological fatigue via scheduling accommodations, targeted literacy expressive language remediation via daily small-group interventions, numeracy enrichment via contextualized concrete materials, and structured home-school partnership via orientation workshops and low-cost learning strategies. Sustainability ensured via multi-stakeholder contingency framework leveraging Barangay Health Center, LGU Nutrition Councils, NGOs Adopt-a-School.

Study limitations: purposive n=14 selected group, descriptive cross-sectional, no causal inference, reliance secondary

records. Future research may involve larger populations, longitudinal tracking beyond one school year, additional factors such as socioeconomic status, food insecurity, parental education. For Bulacao Community School, institutionalizing integrated monitoring will prevent expanding foundational learning deficits, reduce repetition dropout risk, and promote holistic development aligned with RA 11037 mandate and DepEd kindergarten assessment guidelines. Ultimately, cognitive readiness of undernourished kindergarten learners is not fixed deficit but malleable developmental trajectory responsive to synchronized health, developmental, and instructional support.

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