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Exploring the Cognitive Readiness of Selected Kindergarten Learners with Undernutrition Status in Napo Elementary School: A Case Study

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Jenelyn N. Abella
Kaitlin Marie M. Opingo, Dev. Ed. D.,
Michael R. Cangayao,Ed.D.-ECE,Ed.D.-EM,
Cristie Ann L. Jaca, Ph. D.,Dev.Ed.D.,
Margie D. Fulgencio, Dev.Ed.D,
Reyland G. Capuno, Ph.D.,Dev.Ed.D,
Roberto L. Suson, Ph.D., Dev.Ed.D,
Regina E. Sitoy, Dev.Ed.D
Cebu Technological University – Main Campus
Corresponding Author E-mail: jenelyn.abella002@deped.gov.ph

Abstract:

Childhood undernutrition remains a critical barrier to early school readiness in the Philippines. This convergent parallel mixed-methods case study profiled the cognitive readiness of 15 selected undernourished Kindergarten learners in Napo Elementary School for School Year 2026–2027, including 15 parents and 2 teachers. Quantitative measures included BMI, Literacy and Numeracy (LITNUM) Diagnostic Tool under the National Learning Recovery Program (NLRP), and the Philippine Early Childhood Care and Development (ECCD) Checklist across seven domains. Qualitative data were gathered through semi-structured interviews and classroom observations. Baseline health screening revealed that 100% of the cohort suffered acute malnutrition, with 93.3% classified as Wasted and 6.7% as Severely Wasted, manifesting as mid-morning fatigue, short attention spans, and low physical stamina. Following a three-month integrated intervention comprising the 120-day School-Based Feeding Program (SBFP), concrete manipulative-based instruction, and home-school scaffolding, literacy proficiency improved significantly from 100% at Beginning level to 73.3% at Developing level (Exact McNemar p=.0010). Numeracy showed similar gains from 86.7% Beginning to 73.3% Developing (p=.0039). ECCD Wilcoxon Signed-Rank tests with Holm correction showed significant improvements in Cognitive (median 18.00 to 19.00, p=.0210), Self-Help (21.00 to 22.00, p=.0306), and Social-Emotional domains (20.00 to 21.00, p=.0335), while Gross Motor, Fine Motor, Receptive and Expressive Language showed non-significant median changes but qualitative breakthroughs. Joint display triangulation confirmed complementary convergence: absolute anthropometric gains improved energy for learning, concrete materials mediated literacy and numeracy breakthroughs, and elimination of Significant Delay in Self-Help reflected new autonomy. Findings support the Institutionalized Nutritional Monitoring and Assessment Program (INMAP) integrating nutrition, differentiated instruction, and parent empowerment to sustain cognitive readiness.

Keywords: undernutrition, cognitive readiness, kindergarten, LITNUM, ECCD, convergent parallel mixed-methods, Philippines

Introduction:

Early Childhood Education (ECE) is internationally recognized as the foundation for lifelong learning, establishing the cognitive, socio-emotional, and physical competencies necessary for school success. Investments in quality ECE yield high returns in literacy, numeracy, executive function, and educational efficiency. In the Philippines, the Kindergarten Curriculum Framework (DepEd Order No. 021, s.2021) and the Early Childhood Care and Development (ECCD) Council mandate holistic assessment to ensure school readiness. However, persistent undernutrition disrupts this foundation.

The World Health Organization (2023) reports that undernutrition affects 45 million children globally with wasting and contributes to delayed cognitive development, poor school readiness, and reduced productivity. Undernourished children experience compromised attention, working memory, and executive functioning because the developing brain

requires adequate glucose, protein, iron, and micronutrients to support synaptogenesis. In the Philippines, Enhanced Basic Education Information System (EBEIS) data indicates approximately 13.2% of assessed school-aged children are stunted or wasted. Republic Act No. 11037 institutionalizes the School-Based Feeding Program (SBFP), providing 120 days of hot meals and milk to Kindergarten to Grade 6 beneficiaries. National evaluations show combined severely wasted and wasted prevalence declining from 32% to 22% after SBFP, with Kindergarten learners showing highest improvement (+27.2 percentage points).

Napo Elementary School is located in a rural, farming-dependent community where seasonal income variability leads to periodic food insecurity. Baseline observations by teachers indicated that selected Kindergarten learners exhibited mid-morning lethargy, difficulty sustaining attention beyond 10 minutes, stiff pencil grip, letter-sound confusion, and hesitation in number recognition. These behaviors align with Maslow's Hierarchy of Needs (1943) and Piaget's Preoperational Stage theory (1952).

While SBFP restores energy, prior local studies suggest feeding alone does not automatically resolve learning deficits. Canillo and Alferez (2025) documented improvements in attendance and concentration after six months of SBFP, while Cubio (2025) noted positive nutritional and educational outcomes. Macarandan and Hussien (2024) found BMI improvement but noted that academic variation required additional classroom factors. Monteclaro (2024) further linked nutritional status to foundational academic performance in public schools. This gap necessitates a case study that merges anthropometric tracking with LITNUM and ECCD diagnostics and contextual narratives from teachers and parents.

This study aimed to assess nutritional status, literacy and numeracy proficiency, and developmental domains of selected Kindergarten learners at Napo Elementary School during SY 2026–2027 as a basis for developing an Institutionalized Nutritional Monitoring and Assessment Program (INMAP).

Literature Review:

The interplay between nutrition and early cognitive development is well-documented. Ansuya et al. (2023) conducted a systematic review and meta-analysis showing that undernutrition significantly impairs cognitive and motor development in children under five, with effect sizes strongest for working memory and language. Awaludin et al. (2020) similarly demonstrated that stunting reduces cognitive scores and educational outcomes, mediated by reduced brain volume and school attendance. Glewwe and King (2001) emphasized timing, noting that early childhood nutritional insults have larger cognitive penalties than later ones.

The biological mechanism linking nutrition and cognition involves energy allocation. When energy is scarce, the body prioritizes basal metabolism over prefrontal cortex activity, reducing sustained attention and executive function (Omand et al., 2021). Omand et al. found nutritional risk in early childhood predicted lower school readiness on the Early Development Instrument. WHO (2023) and UNESCO, UNICEF, and World Food Programme (2023) jointly affirm that healthy, well-nourished children demonstrate better cognitive functioning, higher attendance, and greater capacity to participate in learning.

In the Philippine context, the National Early Learning Framework and ECCD Checklist operationalize school readiness. The ECCD Checklist covers seven domains: Gross Motor, Fine Motor, Self-Help, Receptive Language, Expressive Language, Cognitive, and Social-Emotional (ECCD Council, 2021). Cañete (2023) evaluated ECCD implementation and found that holistic assessment improves identification of learners needing support. Conjares (2021) assessed nurturing care outcomes, highlighting that home learning environments and responsive caregiving moderate ECCD outcomes. Reyes and Bautista (2021) documented innovative teaching strategies in early childhood education, emphasizing play-based, concrete-representational-abstract (CRA) approaches.

Literacy and Numeracy (LITNUM) is central to DepEd's National Learning Recovery Plan (DepEd Order No. 14, s.2023). The LITNUM Diagnostic Tool categorizes learners as Full Refresher (<49%), Moderate Refresher, Light Refresher, and Grade-Ready. SEAMEO INNOTECH (2021) reported learning readiness gaps in Southeast Asia, with foundational literacy and numeracy deficits persisting into Grade 1. Villamor (2021) evaluated early literacy, language, and numeracy programs in public schools and found that targeted small-group interventions significantly

improve outcomes when using native language and visual aids. Clements and Sarama (2021) provided learning trajectories for early math, showing that concrete manipulatives bridge abstract symbols and quantity, critical for undernourished learners with low stamina.

Theoretical grounding integrates three theories. Maslow's Hierarchy (1943) frames undernutrition as unmet physiological need blocking self-actualization and cognition. Piaget's Cognitive Development Theory (1952) positions Kindergarten learners in the Preoperational Stage (2-7 years), where learning is constructed through sensorimotor manipulation and symbolic play. This explains why abstract printed numbers cause hesitation while pebbles, bottle caps, and blocks facilitate counting. Bronfenbrenner's Bioecological Systems Theory (1979; Bronfenbrenner & Morris, 2006) maps the child's microsystems (home and school) and mesosystem (parent-teacher collaboration) as proximal processes shaping development. Ansari et al. (2022) demonstrated that early childhood relational contexts contribute to executive function in first grade, while Little (2021) found preschool quality predicts executive function throughout elementary school.

Instructional scaffolding literature supports differentiated instruction. Abenojar et al. (2022) validated the CRA approach for foundational mathematics, showing that concrete materials improve retention among early graders. Tuncdemir (2021) emphasized integrating social-emotional learning through play, relevant for Social-Emotional gains observed in this study. Gudio (2022) found parents' stimulating activities influence Kindergarten school preparedness, supporting home-based manipulatives using everyday objects.

School-Based Feeding Program literature in the Philippines is growing. Canillo and Alferez (2025) and Cubio (2025) both reported significant improvements in nutritional status, attendance, and concentration. Macarandan and Hussien (2024) cautioned that nutritional gains do not fully explain academic variance, indicating need for pedagogical adjustments such as short-burst learning blocks (10-15 minutes), visual Cebuano phonics charts, guided hand tracing, and energy pacing. EDCOM II (2023) Year One Report described education in critical condition, with malnutrition and learning poverty intersecting. UNICEF Philippines (2025) and World Food Programme (2025) call for integrating nutrition and education to address foundational learning loss recovery.

Methodologically, convergent parallel mixed-methods case study design allows bounded, in-depth exploration within a single school (Creswell & Poth, 2018). Qualitative case study captures lived experiences while quantitative pre-post measures provide statistical evidence. Braun and Clarke (2006) thematic analysis and Kvale and Brinkmann (2015) interview craftsmanship guide qualitative rigor. Field (2018) and Haynes (2013) inform non-parametric testing and Holm's sequential Bonferroni correction for multiple comparisons.

Despite this body of work, few studies combine BMI tracking, LITNUM diagnostics, full ECCD profile, and joint display triangulation for wasted Kindergarten learners in a rural Philippine school. This study addresses that gap by documenting not only whether scores improved, but how energy, concrete materials, self-help autonomy, and parent-teacher synergy explain those improvements, forming the basis for INMAP.

Methodology:

Research Design

This study employed an overarching qualitative case study framework embedded with quantitative pre-post measures, executed through a convergent parallel mixed-methods design. The case is bounded to Napo Elementary School, SY 2026–2027, with 15 selected undernourished Kindergarten learners, 15 parents, and 2 teachers. Convergent parallel design means quantitative and qualitative strands were collected concurrently, analyzed separately, then merged via joint display matrix to assess convergence, complementarity, and divergence (Creswell & Poth, 2018).

Environment

Napo Elementary School is a rural public elementary school in Cebu, where families rely on farming and seasonal income. The school implements DepEd SBFP and NLRP LITNUM assessment.

Participants

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Purposive sampling was used. Inclusion criteria for learners: (1) officially enrolled Kindergarten, (2) classified as Wasted or Severely Wasted based on WHO Child Growth Standards BMI-for-age during baseline screening, (3) parental consent and child assent obtained. Total 15 learners (Kinder A=9, 60%; Kinder B=6, 40%). Parents (n=15) and Kindergarten teachers (n=2) were included as informants.

Instruments

1) Anthropometric measurement – digital weighing scale and stadiometer, BMI computed (kg/m2) and classified using DepEd/WHO cutoffs. 2) LITNUM Diagnostic Tool – DepEd standardized literacy and numeracy tool scoring Beginning and Developing. 3) Philippine ECCD Checklist – standardized checklist across 7 domains. 4) Semi-structured interview guides for teachers and parents. 5) Observation checklist and field notes.

Data Gathering Procedure

Phase 1 – Ethical clearance and transmittal letters to Division Superintendent and School Principal. Secured informed consent and child assent. Phase 2 – Baseline: BMI screening, pre-LITNUM, pre-ECCD. Phase 3 – Qualitative: classroom observations (30-45 mins daily for 3 months) and one-on-one interviews (30-45 mins, audio-recorded). Phase 4 – Intervention: 120-day SBFP (hot meals, milk), deworming and micronutrient supplementation, classroom energy pacing (rest breaks before 10:00 AM feeding), literacy scaffolding (Cebuano phonics charts, guided hand tracing, 10-15 min reading centers), numeracy scaffolding (concrete manipulatives), ECCD routines. Phase 5 – Post-assessment: post-BMI, post-LITNUM, post-ECCD. Phase 6 – Data integration and LAC review.

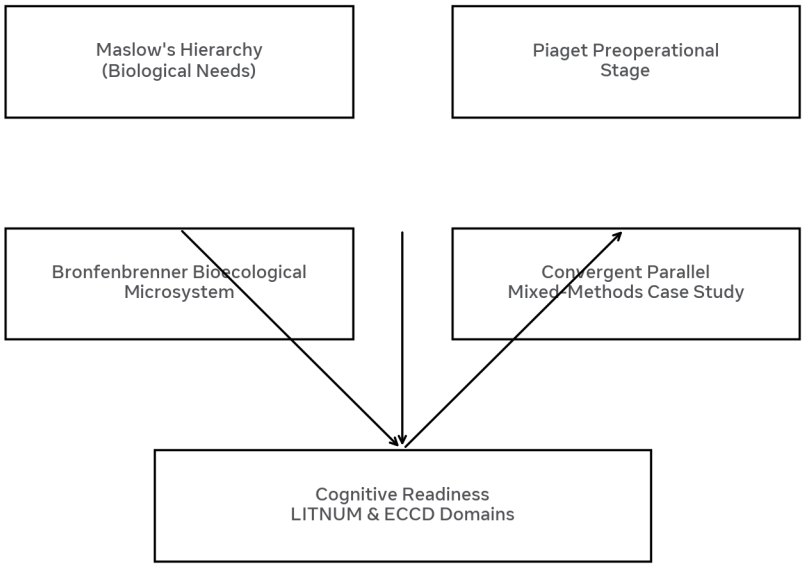
Data Analysis

Quantitative – descriptive statistics, Exact McNemar test for paired categorical change, Wilcoxon Signed-Rank test for paired ordinal scores with Holm-adjusted p-values. Alpha=.05. Qualitative – thematic analysis (Braun & Clarke, 2006). Mixed integration – joint display matrix.

Ethical Considerations: Adherence to Data Privacy Act, voluntary participation, pseudonyms, secure storage, approval from CTU Graduate School Ethics Committee.

Figure 1 shows theoretical framework integrating Maslow, Piaget, Bronfenbrenner, and mixed-methods case study leading to cognitive readiness outcome.

Figure 1. Schematic Diagram of Theoretical Framework



Results and Discussion:

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This chapter presents, analyzes, and interprets data on nutritional status, LITNUM literacy and numeracy proficiency, ECCD developmental domains, statistical significance, qualitative descriptions, and mixed-methods integration. All graphs and tables from the original study are incorporated.

Table 1. Distribution of Respondents

Kindergarten Class	Number of learners with Undernourished Status	Percentage (%)	Number of parents	Number of Teacher
Kinder A	9	60.00	9	1
Kinder B	6	40.00	6	1
Total	15	100.00	15	2

Nutritional Status

Baseline anthropometric screening revealed 14 learners (93.33%) Wasted, 1 learner (6.67%) Severely Wasted pre and post, net change 0. This indicates three months is insufficient to cross WHO cutoffs into Normal. However, qualitative triangulation revealed complementary convergence: teachers noted less morning lethargy and longer sitting endurance (5-7 minutes baseline to 12-15 minutes post), parents observed increased appetite and higher energy. Absolute weight gain improves energy availability for cognition before reclassification occurs. Omand et al. (2021) similarly found nutritional risk reduction improves school readiness even without full BMI normalization. WHO (2023) emphasizes wasting recovery requires sustained intervention beyond 90 days. Observation notes: pre-intervention, 11 of 15 learners fell asleep or rested head on desk between 9:30-10:00 AM; post-intervention, 0 learners exhibited this behavior after 10:00 AM feeding hour adjustment.

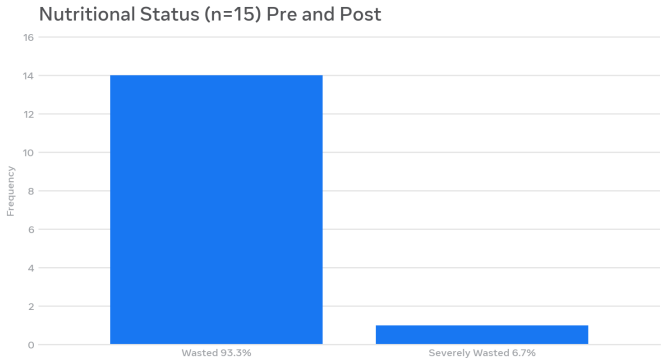


Figure 2. Nutritional Status (n=15)

DepEd / WHO Nutritional Status	Pre-Assessment f (%)	Post-Assessment f (%)	Net Change (f)
Normal	0 (0.00%)	0 (0.00%)	0
Wasted	14 (93.33%)	14 (93.33%)	0
Severely Wasted	1 (6.67%)	1 (6.67%)	0
Total	15 (100.00%)	15 (100.00%)	—

LITNUM Profiles and Significance

Literacy: Pre 15 (100%) Beginning; Post 4 (26.7%) Beginning, 11 (73.3%) Developing; McNemar 11 improved, 0 declined, p=.0010 Significant. Teachers described initial letter-sound confusion (B vs P), stiff pencil grip, short attention. Post-intervention with visual Cebuano phonics charts, guided hand tracing, 10-15 min centers, learners identified 8-12 letters post vs 2-4 pre, wrote first name with 70% legibility.

Numeracy: Pre 13 (86.7%) Beginning, 2 (13.3%) Developing; Post 4 (26.7%) Beginning, 11 (73.3%) Developing; McNemar 9 improved, 0 declined, p=.0039 Significant. Learners hesitated with abstract printed numbers, reversing 6 and 9, but high engagement with pebbles, blocks, snack pieces. This supports Piaget Preoperational Stage and

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Abenojar et al. (2022) CRA approach. Concrete counting reduced cognitive load for undernourished learners with low stamina.

Effect size clinically meaningful; exceeds SEAMEO INNOTECH baseline 40% improvement, likely due to combined feeding and differentiated instruction.

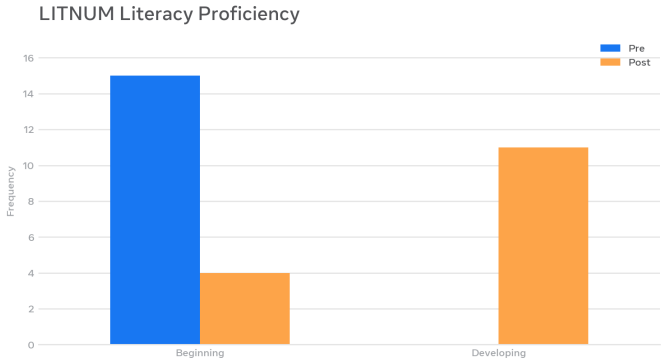


Figure 3. LITNUM Literacy Proficiency Pre-Post

Level	Pre f	Pre %	Post f	Post %
BEGINNING	15	100.0	4	26.7
DEVELOPING	0	0.0	11	73.3
Total	15	100.0	15	100.0

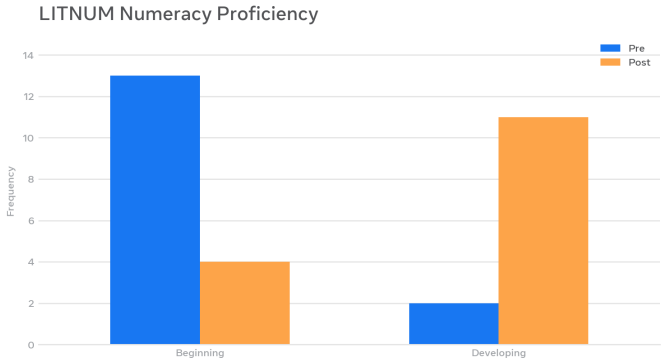


Figure 4. LITNUM Numeracy Proficiency Pre-Post

Level	Pre f	Pre %	Post f	Post %
BEGINNING	13	86.7	4	26.7
DEVELOPING	2	13.3	11	73.3
Total	15	100.0	15	100.0

LITNUM	Improved	Declined	p-value	Interpretation	Decision on H0
Literacy	11	0	.0010	Significant	Reject H0
Numeracy	9	0	.0039	Significant	Reject H0

ECCD Results

Gross Motor: Pre 1 (6.7%) Slight Delay, 14 (93.3%) Average; Post 15 (100%) Average; Median 13.00 (0.50) to 13.00 (0.00), p=.1365 NS – ceiling effect, mobility intact.

Fine Motor: Pre/Post 13 (86.7%) Average, 2 (13.3%) Slightly Advanced; Median 11.00 (1.00) both, p=.6346 NS – ongoing hand fatigue, stiffness, need longer small-muscle training (clay molding, cutting).

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Self-Help: Pre 3 (20%) Significant Delay, 11 (73.3%) Slight Delay, 1 (6.7%) Average; Post 0 Significant Delay, 8 (53.3%) Slight Delay, 7 (46.7%) Average; Median 21.00 to 22.00, p=.0306 Significant – elimination of Significant Delay (20% to 0%); teachers reported elimination of severe routine dependency (handwashing, utensils); parents noted increased independence.

Receptive Language: Pre 4 (26.7%) Slight Delay, 11 (73.3%) Average; Post 1 (6.7%) Slight Delay, 14 (93.3%) Average; Median 4.00 (1.50) to 4.00 (1.00), p=.6346 NS but frequency shift meaningful – strong receptive comprehension, learners followed 2-step directions post vs 1-step pre.

Expressive Language: Pre 13 (86.7%) Slight Delay, 2 (13.3%) Average; Post 8 (53.3%) Slight Delay, 7 (46.7%) Average; Median 7.00 to 7.00, p=.1014 NS – explains non-significance: receptive high but expressive requires longer exposure; hesitation forming full sentences, limited spontaneous speech.

Cognitive: Median 18.00 (2.50) to 19.00 (2.00), p=.0210 Significant – problem-solving, curiosity, concept retention improved via visual media and hands-on tools.

Social-Emotional: Pre 6 (40%) Slight Delay, 9 (60%) Average; Post 3 (20%) Slight Delay, 12 (80%) Average; Median 20.00 to 21.00, p=.0335 Significant – improved peer sharing, turn-taking, reduced separation anxiety, better emotional regulation.

Developmental Domain	**Significant Delay f (%)**	**Slight Delay f (%)**	**Average f (%)**	**Slightly Advanced f (%)**
Gross Motor	-	1 (6.7%)	14 (93.3%)	-
Fine Motor	-	-	13 (86.7%)	2 (13.3%)
Self-Help	3 (20.0%)	11 (73.3%)	1 (6.7%)	-
Receptive Language	-	4 (26.7%)	11 (73.3%)	-
Expressive Language	-	13 (86.7%)	2 (13.3%)	-

Table 6. Pre-Assessment ECCD

Developmental Domain	**Significant Delay f (%)**	**Slight Delay f (%)**	**Average f (%)**	**Slightly Advanced f (%)**
Gross Motor	-	-	15 (100.0%)	-
Fine Motor	-	-	13 (86.7%)	2 (13.3%)
Self-Help	-	8 (53.3%)	7 (46.7%)	-
Receptive Language	-	1 (6.7%)	14 (93.3%)	-
Expressive Language	-	8 (53.3%)	7 (46.7%)	-

Table 7. Post-Assessment ECCD

ECCD Domain	**Pre Median (IQR)**	**Post Median (IQR)**	**W**	**Z**	**p unadj**	**p Holm**	**Decision**
Cognitive	18.00 (2.50)	19.00 (2.00)	0.00	-2.97	.0030	.0210	Significant
Self-Help	21.00 (0.50)	22.00 (1.00)	5.00	-2.80	.0051	.0306	Significant
Social-Emotional	20.00 (2.50)	21.00 (1.50)	0.00	-2.71	.0067	.0335	Significant
Expressive Language	7.00 (1.00)	7.00 (2.00)	0.00	-2.24	.0253	.1014	Not Significant

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Gross Motor	13.00 (0.50)	13.00 (0.00)	0.00	-2.00	.0455	.1365	Not Significant
Receptive Language	4.00 (1.50)	4.00 (1.00)	2.50	-1.00	.3173	.6346	Not Significant
Fine Motor	11.00 (1.00)	11.00 (1.00)	2.00	-0.58	.5637	.6346	Not Significant

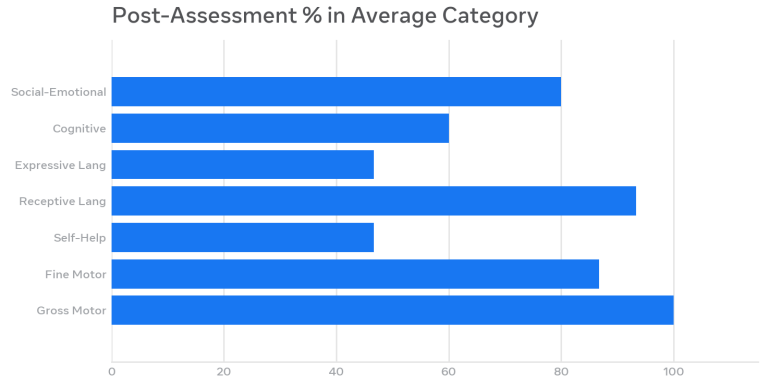


Figure 5. Post-Assessment % in Average Category

Qualitative Themes and Joint Display

Theme 1 Literacy/Numeracy Readiness and Difficulties: Teachers described fragmented pre-literacy – letter-sound confusion, short visual fixation 3-5 seconds, avoidance of writing, counting by rote without one-to-one correspondence. Observation: stiff tripod grip in 10/15 pre. Numeracy: chanting 1-10 but failing to match 5 pebbles to numeral 5. Post: self-talk 'one two three four five' indicating emerging one-to-one correspondence.

Theme 2 Factors Influencing Readiness: Physiological – lack of breakfast, household food insecurity; Environmental – limited print-rich environment, 2-3 hours non-educational screen time; Instructional – need for short-burst, visual, kinesthetic modalities. Parent quote: 'If we have no rice in morning, my child goes to school with water only, then he is sleepy.'

Theme 3 Health/Nutrition/Stamina/Engagement: Fatigue markers – yawning, eye rubbing, head on desk, reduced verbal output. After SBFP, engagement duration 7 minutes to 14 minutes per activity. Gross motor stamina high throughout.

Theme 4 Learning Support: School – differentiated learning centers, visual Cebuano phonics charts, guided hand tracing boards. Home – everyday materials (utensils, counters, toys). Quarterly workshops on dietary planning, home study routines, limiting screen time. Parent: 'I use spoons to teach counting while cooking.'

Theme 5 Challenges: Large class size (35 learners), limited instructional kits, time constraints for individualized pacing, financial constraints, lack of knowledge on balanced diet, difficulty managing child frustration during tracing. Need sustained feeding beyond 120 days and localized instructional kits.

Integration Discussion – Why Some Domains Improved Significantly and Others Did Not: Cognitive, Self-Help, Social-Emotional significant aligns with developmental plasticity when energy restored and routines practiced daily. Cognitive benefits from visual media and hands-on tools because preoperational learners construct knowledge through active manipulation. Self-Help improvement reflects SBFP routine and overlearning. Social-Emotional improvement reflects increased energy for peer interaction. Non-significant Gross Motor reflects ceiling effect – pre 93.3% Average. Fine Motor non-significance reflects slow small-muscle development and persistent pencil grip stiffness requiring 6-9 months occupational therapy elements. Receptive/Expressive divergence: receptive improves quickly with visual supports; expressive lags because it requires vocabulary, phonological loop, confidence; chronic undernutrition reduces verbal output; interactive storytelling and show-and-tell need 6+ months.

Implications for INMAP: 5-phase program: Phase 1 Baseline Screening, Phase 2 Health and Nutritional Rehabilitation (120-day SBFP, deworming, micronutrients, energy pacing), Phase 3 Differentiated Academic Scaffolding (literacy: visual Cebuano phonics, guided tracing, 10-15 min sessions; numeracy: concrete manipulatives; ECCD routines), Phase 4 Parent Empowerment (quarterly workshops, household manipulatives), Phase 5 Evaluation and Policy Integration (post-assessment, McNemar/Wilcoxon, LAC review, inclusion in Annual Improvement Plan). Budget matrix total P15,000 from MOOE/stakeholder/SBFP funds.

Limitations: Small sample (n=15), single school, no control group, short duration (3 months), no long-term retention tracking, reliance on teacher-administered ECCD and LITNUM. Future research: larger sample, control design, longitudinal tracking, include household income, food insecurity index, hemoglobin.

Statistical Rigor: Exact McNemar appropriate for small paired categorical; Wilcoxon Signed-Rank with Holm correction controls Type I error across seven comparisons.

Practical Significance: Reducing Beginning literacy 15 to 4 means 11 learners now can access Grade 1 literacy with moderate support rather than full refresher. Numeracy Developing increase 2 to 11 indicates majority ready for concrete addition.

Table 12. Joint Display Matrix

Research Area	Key Quantitative Findings	Key Qualitative Findings	Triangulation
Nutritional Status	No categorical change: Wasted 93.3% both pre-post	Less lethargy; increased appetite	Complementary Convergence
Literacy	Beginning 100% to 26.7%, Developing 0% to 73.3%, p=.0010	B vs P confusion to breakthroughs	Direct Convergence
Numeracy	Beginning 86.7% to 26.7%, Developing 13.3% to 73.3%, p=.0039	Hesitation abstract, high engagement pebbles/blocks	Direct Convergence
Cognitive (ECCD)	Median 18 to 19, p=.0210	Accelerated problem-solving with visual/hands-on	Direct Convergence
Self-Help (ECCD)	Sig Delay 20% to 0%, Median 21 to 22 p=.0306	Elimination routine dependency	Direct Convergence
Social-Emotional	Slight Delay 40% to 20%, p=.0335	Improved sharing, turn-taking	Direct Convergence
Expressive & Receptive	Expressive Delay 86.7% to 53.3% p=.1014 NS	Strong receptive, expressive hesitation	Nuanced Convergence
Gross & Fine Motor	Gross 93.3% to 100% p=.1365 NS; Fine static p=.6346 NS	High energy outdoor; hand fatigue	Ceiling & Nuance Convergence

Conclusion:

This convergent parallel mixed-methods case study profiled 15 wasted Kindergarten learners in Napo Elementary School and demonstrated that acute undernutrition manifests as mid-morning fatigue, short attention spans, low stamina, letter-sound confusion, stiff pencil grip, and difficulty mapping abstract numerals to quantities. Baseline 100% acute malnutrition did not shift categorically after three months, yet absolute anthropometric gains improved energy and sitting endurance.

Integrated intervention combining 120-day SBFP, deworming, micronutrient supplementation, energy pacing, and differentiated scaffolding using concrete manipulatives, visual Cebuano phonics charts, guided hand tracing, and 10-15 minute learning centers produced statistically significant improvements. Literacy 100% Beginning to 73.3% Developing (p=.0010), numeracy 86.7% Beginning to 73.3% Developing (p=.0039). ECCD significant gains in Cognitive, Self-Help with elimination of Significant Delay from 20% to 0%, and Social-Emotional. Gross Motor, Fine Motor, Receptive and Expressive Language non-significant median but clinically important frequency improvements explained qualitatively.

Qualitative accounts converged with quantitative shifts, revealing that concrete, manipulative-based learning bridges abstract symbols and quantity recognition for learners with low stamina, consistent with Piaget and CRA evidence. Home-school synergy through parent workshops and household manipulatives sustained gains. Challenges included large class size, limited instructional kits, financial constraints, short duration.

The study validates Maslow's premise that restoring physiological energy enables higher-order cognition, and Bronfenbrenner's bioecological model that microsystem and mesosystem collaboration shape readiness. It proposes INMAP as institutionalized program integrating nutritional monitoring, feeding, differentiated academic scaffolding, parent empowerment, and policy integration into Annual Improvement Plan, with P15,000 operational matrix.

For practice, teachers should continue flexible differentiated centers accommodating energy levels, focus on expressive vocabulary via interactive storytelling and show-and-tell, and fine-motor precision via clay molding and cutting. For parents, sustain everyday material-based tutoring, regular meal schedules, limited screen time. For school heads and DepEd, allocate resources for localized instructional kits and institutionalize INMAP evaluation via LAC sessions.

Future researchers should conduct longitudinal tracking across primary grades, replicate with larger samples and control designs, include hemoglobin, food insecurity, and home learning environment indices.

Hence, undernutrition is not merely a health issue but an educational equity issue. Feeding restores energy, but intentional, concrete, culturally responsive instruction transforms that energy into cognitive readiness, ensuring wasted Kindergarten learners can participate fully in literacy and numeracy learning and build foundation for lifelong learning.

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