Math-Maayos, Math-Masaya!: Design and Content Analysis of a Strategic Intervention Material for Kindergarten Seriation

Genevive D. De Leon

Abstract

Seriation—the ordering of objects by a quantitative attribute—is a foundational form of early mathematical reasoning. This instructional design report examines Math-Maayos, Math-Masaya!, a 26-page print Strategic Intervention Material (SIM) developed for the Philippine kindergarten competency on arranging objects by size and length and describing comparative relations. A structured qualitative document analysis examined five domains: curriculum alignment, developmental progression, representation and engagement, assessment coherence, and accessibility and implementation. The artifact contains four guide cards, two activity cards, two assessment cards, one enrichment card, response-reflection prompts, answer keys, and a reference card. Analysis showed a coherent progression from recognizing contrasting attributes to using comparative and superlative language, ordering three objects, and completing visual sequences. The Filipino-language directions, recurring bear-family context, and cut-color-draw tasks support familiarity and active participation. Assessment tasks are closely aligned with the stated competency, but the material would be strengthened by explicit mastery criteria, a scoring guide, alternative response modes, reduced dependence on color and fine-motor skills, and documented expert and learner validation. The report offers a reproducible framework for reviewing teacher-developed SIMs while carefully distinguishing design quality from demonstrated learning effectiveness. The material is suitable for supervised remedial or supplementary use; claims of impact require subsequent field evaluation.

Keywords: strategic intervention material; kindergarten mathematics; seriation; instructional design; document analysis; Philippines

1. Introduction

Early mathematics includes the ability to notice attributes, compare objects, recognize ordered relations, and construct sequences. Seriation requires children to arrange objects according to size, length, or another quantitative property while coordinating multiple comparisons. This reasoning supports later work with number, measurement, patterns, and transitive relations. Because young learners vary in language, prior experience, attention, and fine-motor control, instruction should make the underlying comparison visible through concrete, pictorial, verbal, and action-based experiences.

Strategic Intervention Materials are commonly used in Philippine schools to provide focused support for least-mastered competencies. A SIM typically narrows the learning target and organizes guidance, practice, assessment, enrichment, and feedback into a compact resource. Evidence from Philippine science and mathematics contexts suggests that well-designed SIMs can support achievement, but effectiveness depends on the population, implementation, comparison condition, and quality of evaluation; findings from older learners or other subjects cannot simply be transferred to kindergarten (Borabo & Dio, 2025; Suarez & Casinillo, 2020).

Developmentally appropriate practice calls for curriculum that is meaningful, engaging, responsive to individual differences, and situated in children's linguistic and cultural contexts (NAEYC, 2020). Learning-trajectory perspectives likewise connect a mathematical goal to a developmental progression and activities

matched to children's current thinking (Clements & Sarama, 2004). Universal Design for Learning (UDL) adds attention to barriers in representation, engagement, and action or expression (CAST, 2024). These perspectives provide a defensible basis for examining a print intervention before conducting a field trial.

This article analyzes Math-Maayos, Math-Masaya!, a kindergarten SIM by De Leon (2025). The material targets the competency "Arrange objects one after another in a series/sequence according to a given attribute (size, length) and describe their relationship (big/bigger/biggest or long/longer/longest)" (MKSC-00-10). The study asks: (1) How is the targeted competency translated into an instructional sequence? (2) How coherent are the activities and assessments with the target? (3) What engagement and accessibility features are present? and (4) What revisions and validation steps are needed before claims of educational effectiveness can be made?

2. Method

2.1 Design and unit of analysis

The study used structured qualitative document analysis. The unit of analysis was the complete 26-page, first-edition print artifact, including preliminary pages, competency statement, guide cards, activity cards, assessment cards, enrichment card, answer key, and reference card. The analysis evaluated observable design features; it did not involve children, teachers, classrooms, test scores, or implementation data.

2.2 Analytic framework

Five domains were derived from curriculum-alignment practice, early mathematics learning trajectories, developmentally appropriate practice, DepEd learning-resource evaluation guidance, and UDL: (a) curriculum alignment; (b) developmental progression and scaffolding; (c) representation, language, and engagement; (d) assessment coherence and feedback; and (e) accessibility, usability, and implementation. Each page was reviewed for its instructional function, learner action, attribute addressed, response demand, and feedback opportunity. Recurring features and gaps were recorded and synthesized into a design matrix.

2.3 Quality and interpretive boundaries

Findings were restricted to features visible in the artifact. "Aligned" means that a task directly practices or elicits the stated competency; it does not mean that learners will master the competency. The analysis does not substitute for independent content validation, readability testing, accessibility review, classroom observation, or experimental evaluation. This distinction prevents design appraisal from being misreported as evidence of effectiveness.

3. Results

3.1 Structural organization

The material follows a compact intervention architecture. Four guide cards introduce materials, the bear-family context, size vocabulary, and length vocabulary. Two activity cards ask children to identify contrasting attributes through marking and coloring. Two assessment cards require ordering by size and length through numbering, cutting, and pasting. One enrichment card asks learners to complete sequences by drawing. Reflection prompts use simple emotional or difficulty indicators, followed by answer keys and a reference card.

Component	Primary learner action	Relation to target competency
Guide cards 1-4	Prepare tools; identify and describe size and length; study comparative forms.	Builds vocabulary and attribute discrimination before ordering.
Activity card 1	Circle the small object and box the large object.	Checks recognition of size contrasts.
Activity card 2	Use color to identify longer and shorter objects.	Checks recognition of length contrasts.
Assessment card 1	Number three objects in ordered size sequences.	Elicits seriation by size.
Assessment card 2	Cut and paste objects from short to long or the reverse.	Elicits seriation by length with manipulation.
Enrichment card 1	Draw a missing object to complete a sequence.	Extends from ordering given objects to generating a missing term.
Reflection prompts	Indicate affect, persistence, or difficulty.	Provides a simple learner-response checkpoint, not a mastery score.

3.2 Curriculum alignment

The objectives decompose the competency into identification, arrangement, and sequence completion. The learning tasks reflect those components in the same order. Size and length are treated separately during initial instruction, reducing simultaneous processing demands, and are later expressed through comparative and superlative terms. The closest alignment occurs in the assessment cards, where learners must order three objects rather than merely name a contrast. The enrichment task adds productive reasoning by requiring a child to infer and draw the missing item.

3.3 Developmental progression and scaffolding

The sequence moves from two-object discrimination to three-object ordering and finally sequence completion. This is broadly consistent with a learning-trajectory logic: establish the attribute, compare exemplars, order a small set, and generalize the relation. Examples precede independent work, and recurring labels create predictable routines. However, the artifact does not explicitly diagnose a child's entry level, specify when to return to an earlier card, or offer graduated prompts when ordering fails. Teacher mediation is therefore important.

3.4 Representation, language, and engagement

The Filipino directions and familiar objects support contextual accessibility. A bear-family narrative provides continuity, while large illustrations and action-oriented tasks—circling, boxing, coloring, numbering, cutting, pasting, and drawing—vary the response mode. Emotional check-ins may help teachers notice frustration or confidence. Nevertheless, illustrations sometimes carry the full conceptual distinction. Without teacher questioning or manipulation of real objects, children may rely on perceptual guessing rather than articulating why one item is longer or larger.

3.5 Assessment coherence and feedback

Assessment content matches the instructional target and the answer key permits rapid checking. The shift from recognition tasks to ordering tasks is a strength because it distinguishes prerequisite knowledge from the target performance. Yet no mastery threshold, scoring rubric, error taxonomy, or decision rule is provided. A teacher cannot determine from the material alone how many correct responses constitute mastery, which errors require reteaching, or how results should guide subsequent instruction. The affective prompts are useful conversation starters but should not be interpreted as evidence of learning.

3.6 Accessibility and implementation

The workbook is printable and can be implemented with common materials: pencil, crayons, scissors, and paste. It can support individual, small-group, or home-guided practice. Barriers remain for learners with low vision, color-vision differences, limited fine-motor control, language needs, or insufficient adult assistance. Instructions that depend on red/blue coloring should also include shape, position, or verbal alternatives. Cutting tasks need safety supervision and an option such as pointing, ordering loose cards, or oral response.

4. Discussion

The analysis indicates strong internal coherence: the competency, examples, learner actions, and culminating tasks generally point to the same mathematical idea. The instructional sequence is more than a collection of worksheets because it progressively changes what the learner must do—from notice, to compare, to order, to complete. This progression aligns with the principle that early mathematics instruction should connect goals, developmental levels of thinking, and matched activities (Clements & Sarama, 2004).

The material's contextual strengths are also pedagogically significant. Filipino directions, familiar objects, and the bear-family theme may reduce unnecessary language distance and invite participation. Developmentally appropriate practice emphasizes joyful engagement and responsiveness to learners' contexts, while UDL encourages multiple means of engagement, representation, and expression (CAST, 2024; NAEYC, 2020). The material offers varied actions, but genuine flexibility requires alternatives that preserve the mathematical construct when color perception, fine-motor skill, or access to tools creates a barrier.

A major implication is that product quality and impact evidence must remain separate. A coherent SIM can be recommended for pilot use, but it cannot be described as effective until learning outcomes are evaluated using a suitable design. An initial validation phase should engage kindergarten teachers, an early mathematics specialist, a language reviewer, a learning-resource evaluator, and an accessibility reviewer. Cognitive interviews or think-aloud sessions with a small number of children can identify ambiguous instructions and unintended visual cues before a larger pilot.

A subsequent effectiveness study could use a pretest-posttest comparison with clear inclusion criteria, equivalent measures, implementation-fidelity records, and appropriate safeguards for minors. Random assignment would provide stronger causal evidence where feasible; otherwise, baseline comparability and confounding must be addressed. Outcomes should include not only total accuracy but the ability to explain comparisons, transfer ordering to unfamiliar objects, and maintain learning after a delay.

5. Recommendations for Revision and Validation

Priority	Revision	Purpose
1	Add a teacher guide with entry assessment, prompts, pacing, and reteaching paths.	Makes implementation consistent and responsive.
2	Define item scoring, mastery threshold, error categories, and progress-record form.	Connects assessment evidence to instructional decisions.
3	Add non-color and low-fine-motor response options.	Reduces accessibility barriers while preserving the construct.
4	Standardize Filipino terminology, spacing, punctuation, and line breaks through language editing.	Improves readability and production quality.
5	Conduct independent LRMDS-style content, instructional, technical, IPR, and accessibility review.	Establishes documented quality assurance.
6	Pilot with children under approved ethical and parental-consent procedures.	Tests comprehension, usability, safety, and preliminary learning outcomes.

The highest-priority revision is the teacher-facing decision system. Each card should specify the expected response, observable misconception, recommended prompt, and criterion for advancement. For example, a child who identifies endpoints but cannot order three objects needs a different prompt from a child who reverses the direction word. Such decision rules would turn the SIM into a more precise intervention rather than a fixed sequence of pages.

6. Conclusion

Math-Maayos, Math-Masaya! translates a kindergarten seriation competency into a coherent sequence of guided examples, recognition activities, ordering assessments, and enrichment. Its localized language, visual continuity, and active response modes make it a promising supplementary resource. The document analysis also identifies essential next steps: explicit mastery criteria, teacher guidance, alternative response modes, systematic quality assurance, and learner validation. The current evidence supports a claim of curriculum-aligned instructional design—not a claim of demonstrated effectiveness. Publication and classroom adoption should preserve that distinction while using the proposed validation pathway to build stronger evidence.

References

Borabo, J., & Dio, R. V. (2025). Effectiveness of strategic intervention material (SIM) in improving Filipino students' performance in science and mathematics: A meta-analysis. Journal of Basic Education Research, 6(2), 79-89. https://doi.org/10.37251/jber.v6i2.1420

CAST. (2024). Universal Design for Learning Guidelines version 3.0. https://udlguidelines.cast.org/

Clements, D. H., & Sarama, J. (2004). Learning trajectories in mathematics education. Mathematical Thinking and Learning, 6(2), 81-89. https://doi.org/10.1207/S15327833MTL0602_1

De Leon, G. D. (2025). Math-Maayos, Math-Masaya!: Strategic intervention material in kindergarten mathematics. Shirley Publishing House.

Department of Education. (2009). Guidelines and processes for LRMDS assessment and evaluation (Version 1.0). https://lrmds.deped.gov.ph/docs/LRMDSGuidelines.pdf

National Association for the Education of Young Children. (2020). Developmentally appropriate practice: A position statement. https://www.naeyc.org/resources/position-statements/dap

Suarez, M. G., & Casinillo, L. F. (2020). Effect of strategic intervention material (SIM) on academic performance: Evidence from students of Science VI. Review of Socio-Economic Research and Development Studies, 4(1), 20-32.