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Evaluating Curriculum Reform: Addressing Gaps and Overlaps in Namibia's Junior Primary Mathematics Curriculum

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Abstract
This study examines the extent to which the recent reforms of Namibia's Junior Primary Mathematics Curriculum have addressed the previously identified gaps and overlaps that limited the development of foundational numeracy. The study argues that although the revised 2015 and 2023 curricula demonstrate notable improvements in content progression, clarity of competencies, and reduction of redundancies, critical weaknesses in conceptual depth and foundational numeracy skills remain unresolved. The problem driving this follow-up analysis is the absence of systematic evaluation over the past decade, despite earlier concerns regarding insufficient place value development, weak mental arithmetic, repetitive content, and limited emphasis on higher-order reasoning. A mixed-methods design combining Curriculum Content Analysis (CCA) and qualitative document analysis, qualitative document analysis of the 2005, 2015, and 2023 syllabi, and a comparative matrix to map content distribution across Grades 1–3. Coding categories were developed deductively from foundational numeracy frameworks and refined inductively during analysis, with inter-document consistency checks to enhance reliability. Triangulation included policy documents, teacher guides, and university numeracy course outlines to evaluate alignment and implementation support. Findings indicate stronger sequencing, clearer learning outcomes, and reduced content overlap, particularly in number operations and problem-solving. However, gaps persist in mental mathematics, depth of place value understanding, conceptual reasoning, assessment alignment, and integration of 21st-century competencies. The study concludes that while reforms have improved curriculum coherence, foundational numeracy challenges remain. Targeted professional development, curriculum–assessment alignment, and periodic curriculum audits are recommended.

Key terms: Curriculum content analysis, curriculum reform, foundational numeracy, junior primary mathematics, Namibia.

1.0 INTRODUCTION

Curriculum development is an ongoing, iterative process that must adapt to changing educational demands, societal expectations, and learner needs (Print, 1993). In mathematics education, international attention has focused on strengthening early numeracy. Foundational skills in the junior primary phase strongly predict later academic achievement (Duncan et al., 2007; NCTM, 2000). Recent research also stresses the importance of conceptual understanding, reasoning, and progression in early mathematics, not just procedural competence (Clements & Sarama, 2014; OECD, 2019). Since independence, Namibia has focused on improving access, equity, and quality in schools, with special attention on mathematics due to its foundational role. The junior primary phase (Pre-primary to Grade 3) is especially important as it underpins later development. Earlier evaluations found the Namibian Junior Primary Mathematics Curriculum had gaps and overlaps, but no systematic follow-up assessed if reforms addressed these issues. The influential earlier study was limited to analysing the 2005 document and did not consider implementation, cognitive demand, or progression across curricula.

This follow-up study, therefore, moves beyond identifying structural gaps in a single curriculum version by providing a longitudinal comparative analysis of the 2005, 2015, and 2023 syllabi. Unlike earlier evaluations, it systematically maps vertical progression, cognitive demand, and curriculum–assessment alignment across reform cycles, thereby generating new evidence on whether structural weaknesses have been substantively resolved or merely reconfigured.

Gaps refer to essential concepts or skills that are missing or insufficiently developed. Miranda and Nakashole (2013) found that while Number Sense was reasonably covered, key components such as place value, mental arithmetic, estimation, and percentages were underrepresented. However, these comparisons predated the 2015 and 2023 revisions and therefore do not account for potential improvements in sequencing, competency articulation, or depth of reasoning tasks. International curriculum reform literature indicates that without systematic monitoring, reforms often reproduce earlier structural weaknesses or shift problems rather than resolve them (Fullan, 2007; Schmidt & Prawat, 2006). This raises a critical policy and research question: To what extent have Namibia's recent reforms meaningfully addressed the previously identified gaps and overlaps in early mathematics?

This study adds new empirical knowledge in three ways. First, it offers a structured evaluation of Namibia's Junior Primary Mathematics Curriculum following nearly a decade of implementation. Second, it combines Curriculum Content Analysis with cognitive demand mapping to assess both coverage and conceptual depth. Third, it provides evidence on how well curriculum intentions, teacher preparation materials, and assessment guidance align.

There are also concerns about curriculum progression, especially in sequencing the four operations, which lacked clear scaffolding (Van de Walle, 2014). Comparative studies show Namibia's curriculum is narrower and less challenging than that of Canada and South Africa (Kleopas & Miranda, 2014), focusing too much on procedures instead of concepts.

The 2015–2023 reforms by NIED aimed to address these weaknesses, but no structured review has assessed their impact in the past decade. Such evaluation is important because ongoing monitoring improves teaching quality, policy decisions, and learner outcomes (Fullan, 2007). The lack of follow-up evaluation leaves a gap in national curriculum scholarship and limits evidence-based policy refinement. Without proper review, curriculum effectiveness may be assumed rather than proven. This study goes further than earlier evaluations by assessing reform effectiveness over time. It identifies structural improvements and continuing problems with concepts. In doing so, it gives evidence to inform curriculum refinement and professional development.

This study, therefore, undertakes a follow-up analysis of the revised Junior Primary Mathematics Curriculum, examining content coherence, progression, alignment, and relevance. The introduction is followed by the theoretical framework, methodology, findings, discussion, and recommendations for strengthening early numeracy education in Namibia. The study contributes to curriculum development policy by providing empirical evidence on reform outcomes; to teacher practice by identifying areas requiring targeted professional development; and to early numeracy research by offering a longitudinal perspective on curriculum evolution in a developing country context. By situating the Namibian case within broader international debates on curriculum quality and progression, the study strengthens both national accountability and comparative scholarship in early mathematics education.

2.0 LITERATURE REVIEW

Curriculum reform and evaluation are central concerns in education systems worldwide, particularly where foundational subjects such as mathematics are concerned. Curriculum development is increasingly viewed as a dynamic, iterative process that requires ongoing assessment and modification in response to evolving educational demands and socio-economic contexts (Print, 1993). In the context of mathematics education, ensuring coherence, progression, and alignment across grades is essential for effective teaching and meaningful learning (OECD, 2024). However, while international literature provides broad principles of curriculum quality, fewer studies examine how reforms in developing contexts translate into measurable structural improvements in early grade mathematics curricula. This limitation is particularly evident in the Namibian context, where post-reform evaluation remains sparse. Within Namibia, scholarship on Junior Primary Mathematics has primarily focused on implementation challenges, teacher preparedness, and learner performance trends, rather than systematic structural analysis of curriculum progression across reform cycles. Studies by Miranda and Nakashole (2013) and Kleopas and Miranda (2014) identified content gaps and limited cognitive demand in earlier syllabi but did not extend their analysis to subsequent revisions. This creates a clear need for updated curriculum-specific scholarship grounded in the Namibian reform trajectory. Central to such evaluations are theoretical frameworks that support systematic analysis of curriculum intentions, structures, and outcomes.

Tyler's (1949) curriculum model has remained a cornerstone in curriculum evaluation, offering a logical and goal-oriented process focused on defining educational purposes, selecting learning experiences, organising those experiences, and evaluating outcomes. Although widely applied, critics argue that Tyler's model can privilege stated objectives over enacted curriculum realities, potentially overlooking classroom-level implementation constraints. Nonetheless, its cyclical revision logic makes it relevant for reform contexts such as Namibia, where previously identified deficiencies in the Junior Primary Mathematics Curriculum require re-examination. In this study, Tyler's model provides a normative framework to evaluate whether revised curriculum objectives explicitly address earlier gaps in foundational numeracy, including place value, mental computation, and conceptual progression. Operationally, Tyler's four principles directly informed the coding framework used in this study: (1) stated objectives were coded to assess clarity and specificity of foundational numeracy goals; (2) prescribed learning experiences were analysed to determine whether they supported stated objectives; (3) content organisation across Grades 1-3 was examined to evaluate sequential progression; and (4) references to assessment and evaluation were analysed to determine alignment with intended outcomes. Thus, Tyler's model shaped both category development and interpretive criteria in the analysis.

Complementing Tyler's framework, Curriculum Content Analysis (CCA) offers an empirical method for evaluating curriculum documents in terms of content coherence, alignment, and progression. CCA focuses on both vertical (across grades) and horizontal (within grade) alignment, ensuring that learning outcomes build logically in complexity and that redundancies or gaps are minimised (Porter, 2002). In mathematics education, where conceptual scaffolding is crucial, CCA helps to reveal not only which topics are covered but also how they are sequenced, the depth at which they are addressed, and their relevance to learners' cognitive development. This analytical lens is especially useful for examining whether curriculum reforms have successfully addressed earlier weaknesses, such as redundancy in content or unclear progression of fundamental mathematical concepts. However, CCA studies often prioritise structural mapping without sufficiently interrogating conceptual depth or cognitive progression, which may limit their explanatory power. This study extends CCA by explicitly analysing both content distribution and cognitive demand within the Namibian Junior Primary Mathematics Curriculum (Grades 1–3).

In practical terms, CCA guided the construction of the comparative matrix used in this study. Topics were mapped across the 2005, 2015, and 2023 syllabi to identify frequency, recurrence, and grade-level positioning. Indicators of progression (e.g., introduction, extension, consolidation) were coded to determine vertical alignment. Bloom's Taxonomy levels were applied to learning objectives to assess cognitive demand, thereby operationalising conceptual depth within the CCA framework. These procedures ensured that analysis moved beyond topic presence to evaluate structural coherence and intellectual progression.

International research underscores the importance of coherent and progressively structured mathematics curricula. For example, alignment studies in mathematics education consistently show that misalignment between curriculum standards, instructional expectations, and assessment tasks can lead to fragmented learning experiences and poor student outcomes (Qhibi et al., 2025; Dhlamini, 2021). In South Africa, misalignment between grade-level expectations and assessment has been linked to limited progression in learners' conceptual understanding, emphasising the need for clear vertical articulation (Dhlamini, 2021). While these studies illuminate regional challenges, they do not examine Namibia specifically, thereby leaving an empirical gap regarding whether similar misalignments persist within Namibia's revised curriculum framework. Similarly, studies in other African contexts highlight that weak progression and lack of depth in curriculum content often correspond with lower learner achievement in foundational numeracy and mathematical reasoning (Adeniran et al., 2025). Yet these multi-country analyses do not disaggregate the Namibian case, justifying the need for a focused national evaluation. Yet these multi-country analyses do not disaggregate the Namibian case, justifying the need for a focused national evaluation.

Namibia-specific assessments, including national examination reports and SACMEQ participation outcomes, have repeatedly indicated uneven numeracy performance at upper primary levels, indirectly reinforcing concerns about early foundational coherence. However, these performance-based studies have not traced learner outcomes back to structural curriculum design, further strengthening the rationale for a document-based longitudinal curriculum review.

Structural curriculum gaps and overlaps remain recurring themes in mathematics reform literature. Content gaps, particularly in mental computation, place value reasoning, and estimation, have been shown to weaken long-term mathematical fluency (OECD, 2024). Overlaps, defined as repetition without increased conceptual complexity, reduce instructional efficiency and learner engagement. However, international reports tend to identify systemic trends without tracing whether specific national reforms have successfully reduced such redundancies over time. In Namibia, earlier analyses (Miranda & Nakashole, 2013) documented these weaknesses in the 2005 syllabus, yet no structured follow-up has assessed the 2015 and 2023 revisions. This absence constitutes a central research gap addressed by the present study.

The National Council of Teachers of Mathematics (NCTM, 2000) emphasises coherence and conceptual scaffolding. While this framework is influential, its principles were developed in a North American policy context, requiring contextual adaptation when applied to Namibia's resource-constrained and multilingual classrooms. Thus, applying coherence principles to the Namibian Junior Primary Mathematics Curriculum requires examining not only stated progression but contextual feasibility.

Qualitative studies on curriculum implementation further indicate that coherent content alone is insufficient without support for teachers in translating curriculum intentions into classroom practice. Research in Namibia's Ohangwena region highlighted that even when curriculum revisions aim to improve inclusivity and critical thinking, challenges such as resource scarcity, inadequate professional development, and crowded classrooms hinder effective enactment (Nghitoolwa, 2025). These findings underscore that curriculum quality must be considered alongside implementation realities, particularly in resource-limited rural contexts. The finding highlights a contradiction in reform discourse: structural curriculum improvement does not automatically translate into improved classroom practice. Therefore, evaluating the Namibian curriculum requires attention to alignment between intended design and implementation guidance. This study incorporates this implementation dimension by triangulating syllabus analysis with teacher education course outlines and policy documents, thereby linking structural curriculum design with institutional preparation and support mechanisms within Namibia.

The need to integrate 21st-century competencies such as problem-solving, reasoning, and data literacy across mathematics curricula has become increasingly salient in global curriculum reform discussions. The OECD's comparative study on mathematics curricula suggests that high-quality curricula balance foundational content with competencies that prepare learners for contemporary challenges, including critical thinking and data interpretation (OECD, 2024). However, evidence from international comparisons suggests that procedural fluency continues to dominate early mathematics instruction (TIMSS, 2023).

CCA studies also highlight that curriculum analyses must consider cognitive demand, not just content coverage. For example, Trends in International Mathematics and Science Study (TIMSS) curriculum analyses reveal that curricula with clearly defined progression and cognitive demand align more closely with improved learner outcomes, as they scaffold learners from basic procedural tasks to reasoning and application (Mullis et al., 2023). TIMSS analyses demonstrate that higher-performing systems show clearer cognitive progression across grades. Yet Namibia's placement within such comparative frameworks has not been systematically analysed at the Junior Primary level, representing another empirical gap.

Identified Research Gaps

Despite extensive international scholarship on curriculum coherence and alignment, four key gaps remain in the Namibian context: a) absence of a systematic post-reform evaluation of the 2015 and 2023 Junior Primary Mathematics syllabi; b) limited analysis of cognitive demand and conceptual depth within Namibia's early grade curriculum progression; c) insufficient examination of whether previously identified gaps and overlaps have been structurally resolved; and d) weak integration of implementation realities into structural curriculum review. This study addresses these gaps by combining Tyler's normative evaluation model with Curriculum Content Analysis to provide an evidence-based, longitudinal review of Namibia's revised Junior Primary Mathematics Curriculum. By doing so, it moves beyond general reform discourse to empirically determine whether structural deficiencies have been remedied.

In summary, the literature emphasises that curriculum reform must be evaluated through both normative and empirical lenses to determine whether structural weaknesses have been remediated. However, a clearly documented national follow-up analysis of Namibia's curriculum reforms remains absent. Tyler's classical model offers a prescriptive basis for evaluating intended curriculum goals, while CCA provides tools for diagnosing content progression, alignment, gaps, and overlaps. Empirical studies from across Africa and internationally confirm that coherence, alignment, and progression in mathematics curricula are essential for learners' conceptual development and long-term achievement. As this study demonstrates, combining these frameworks enables a comprehensive review of the reformed Namibian Junior Primary Mathematics Curriculum, identifying where improvements have succeeded and where further refinement is necessary to support equitable and quality mathematics education.

3.0 METHODOLOGY

This study used a mixed-methods design to evaluate how the Namibian Junior Primary Mathematics Curriculum addressed prior gaps and overlaps. The design combined qualitative document analysis with comparative review to examine both structural and pedagogical changes across the old and new curricula. The mixed-methods approach integrated qualitative thematic analysis of curriculum content and quantitative mapping of concept distribution and cognitive demand. The qualitative strand allowed in-depth interpretation of conceptual progression, coherence, and policy alignment. The quantitative strand offered measurable indicators of topic recurrence, sequencing, and structural shifts. Using both methods enabled a more comprehensive evaluation than either alone (Creswell & Plano Clark, 2018; Johnson & Onwuegbuzie, 2004).

The population consisted of Namibian Junior Primary Mathematics curricular documents, including the 2005 and 2015 syllabi, the revised 2023 syllabus, the Junior Primary Mathematics subject policy, the Integrated Planning Manual (IPM), and course outlines from first- to third-year university teacher training programmes in numeracy and mathematics education. Inclusion criteria required that documents be (a) officially approved national curriculum or policy documents, or (b) documents not directly related to Grades 1–3 mathematics content, or not formally adopted by relevant authorities, were excluded. Documents were chosen using a purposive sampling approach, focusing on those most pertinent to foundational numeracy and covering all key content areas, including Number Concept Development, Computation, Problem Solving, Measurement, Geometry, Data Handling, and Algebra. This strategy was justified on the basis that the selected documents represent the authoritative sources guiding curriculum content, implementation expectations, and teacher preparation in Namibia, thereby ensuring representativeness of the intended curriculum rather than classroom-level variations.

The qualitative component employed Curriculum Content Analysis (CCA) to systematically evaluate content structure, sequencing, coherence, and alignment with national goals and learner developmental needs (Porter, 2002; Tyler, 1949). Coding categories were developed to capture clear competencies, conceptual progression, alignment with policy objectives, overlaps, and content gaps. The coding framework was developed deductively from established foundational numeracy constructs (e.g., place-value depth, operational fluency, problem-solving complexity) and refined inductively through iterative document review. A coding manual was created to ensure consistent application of categories. To enhance reliability, documents were coded in two cycles, with recoding conducted after a two-week interval to verify internal consistency. Discrepancies were resolved through analytic memoing and category refinement. This qualitative strand primarily addressed the research questions related to conceptual coherence, depth, and alignment with reform intentions. It allowed interpretive judgment regarding whether identified gaps (e.g., mental computation or place value reasoning) were substantively addressed rather than merely mentioned.

For the quantitative component, a comparative matrix was constructed to measure the frequency and distribution of core mathematical concepts across Grades 1 to 3, facilitating structured comparisons among the 2005, 2015, and 2023 curricula. The matrix included indicators for topic recurrence, cognitive demand level, and evidence of conceptual progression, allowing identification of both redundancy and developmental scaffolding. Frequency counts were not interpreted in isolation but were contextualised within qualitative thematic patterns to avoid over-reliance on numerical occurrence alone. The data were examined using thematic synthesis combined with cross-document triangulation to enhance the validity and reliability of the results. Triangulation involved comparing syllabus content with policy statements and teacher education course outlines to assess alignment between intended curriculum, implementation guidance, and teacher preparation. Analytical decisions were documented through an audit trail to enhance transparency and replicability.

The qualitative and quantitative components were integrated on two distinct levels. First, during analysis, quantitative matrix findings were used to corroborate or challenge qualitative thematic interpretations (convergent validation). Second, during interpretation, results were synthesised to determine whether structural changes (quantitative evidence) corresponded with improvements in conceptual coherence and progression (qualitative evidence). This integration reflects a convergent parallel mixed-methods design, where both strands were conducted concurrently and merged during interpretation to produce meta-inferences about reform effectiveness. As the study relied exclusively on publicly available curriculum and policy documents, formal ethical clearance was not required under institutional research guidelines. Documents are available on the National Institute for Educational Development (NIED) website, and they are freely accessible to the public without restriction. No human participants were involved, and data were analysed at the document level only. Proper citation and acknowledgement of all official sources were maintained to ensure academic integrity. This approach allowed both normative and empirical insights into Namibian curriculum reforms. The mixed-methods character lies not simply in using counts and narrative, but in purposefully integrating structural measurement with conceptual analysis to draw comprehensive conclusions about curriculum outcomes.

4.0 FINDINGS AND DISCUSSION

The analysis of the Namibian Junior Primary Mathematics Revised Curriculum (2023) in comparison with the earlier 2005 and 2015 versions revealed gradual, significant changes as well as lingering issues regarding content alignment, depth, and clarity. The findings are presented in line with the study's analytical framework and focus areas: gaps, overlaps, conceptual progression, alignment with 21st-century skills, and curricular coherence. These focus areas were derived from Tyler's (1949) principle of sequential and goal-oriented curriculum design and from Curriculum Content Analysis (CCA), which emphasises vertical alignment, cognitive progression, and coherence across grade levels (Porter, 2002).

The revised curriculum addressed some of the foundational gaps identified in earlier evaluations by Miranda and Nakashole (2013), particularly the inclusion of estimation, problem-solving, and conceptual understanding of number patterns. However, gaps remain, especially in areas such as mental mathematics, place value development, and explicit strategies for number decomposition - all of which are essential for early numeracy acquisition (Laski et al., 2015). From a Tylerian perspective, these unresolved gaps indicate partial alignment between stated objectives and sequenced learning experiences, suggesting that intended goals are not yet fully operationalised across grades. From a CCA lens, the vertical progression of these concepts remains insufficiently scaffolded.

For instance, while the 2015 curriculum, which was further revised in 2023, introduces the concept of estimation in Grade 2, it lacks continuity and structured progression into Grade 3. Similarly, mental computation strategies are listed but not emphasised with adequate instructional examples or teacher guidance materials, which limit classroom application. This discontinuity reflects a weakness in vertical alignment as defined by CCA, where progression should demonstrate increasing conceptual complexity rather than isolated topic insertion.

The 2005 curriculum was found to have frequent overlaps between grade levels, especially in basic number operations, where similar topics appeared with minimal variation across Pre-primary and Grades 1–3. The revised 2023 curriculum presents improved vertical alignment, with clearer distinctions in content across grades. For example, addition and subtraction with regrouping, previously repeated in all three grades, are now introduced in Grade 2 and extended in complexity in Grade 3. This progression more closely reflects Tyler's principle of organised sequential learning and demonstrates measurable structural improvement when mapped through the comparative CCA matrix across the three curriculum versions.

This shift suggests improved scaffolding of learning experiences, in line with Tyler's principle of sequential learning (Tyler, 1949). However, minor redundancies remain, especially in the measurement and data handling strands, where learners are exposed to similar graph types and units of measurement without progression in analysis skills. CCA mapping indicates that while topic labels change minimally across grades, the cognitive demand does not consistently advance beyond recognition and basic representation levels.

There is a noticeable improvement in the depth of mathematical concepts across the grades. The revised curriculum emphasises learner-centred approaches and includes practical application of mathematical ideas, such as using manipulatives and everyday examples. This reflects a broader shift toward constructivist pedagogy, consistent with recommendations by Kriek and Grayson (2009) for foundational mathematics teaching in Southern Africa. Within Tyler's framework, this represents improved alignment between learning experiences and intended learner outcomes. However, CCA analysis reveals that while pedagogical language has evolved, cognitive demand levels (as assessed through Bloom's Taxonomy) remain predominantly at remembering and understanding levels, with limited extension to analysing or evaluating.

Despite this, the curriculum's handling of higher-order thinking remains underdeveloped. Learners are seldom expected to justify reasoning, explore multiple strategies, or engage in mathematical argumentation, which are crucial for long-term conceptual development (Kilpatrick et al., 2001). This indicates a partial disconnect between competency statements and measurable learning objectives, suggesting incomplete operationalisation of higher-order goals within curriculum design.

The revised curriculum references problem-solving, reasoning, and communication as core competencies, aligning with national education policy (MoEAC, 2015) and international benchmarks. However, actual integration of these competencies in content descriptions and learning outcomes is inconsistent. Activities that support collaboration, creativity, and digital literacy - hallmarks of 21st-century education—are either implicit or absent, highlighting a gap between policy aspiration and curricular enactment (Voogt & Roblin, 2012). From a Tylerian evaluation standpoint, this reflects misalignment between stated national objectives and structured learning experiences. From a CCA perspective, competencies are declarative rather than systematically embedded across strands.

Structurally, the revised curriculum displays better coherence and integration, with clearer learning objectives and links between topics. However, there are still weak linkages between the curriculum and assessment practices, a concern echoed by Pinar (2012) in relation to many African curricular reforms. Teachers may struggle to translate curriculum intentions into assessment strategies without adequate exemplar materials or training. This finding reinforces international alignment research that curriculum coherence must extend beyond content mapping to include assessment articulation.

The table below presents a content map highlighting the outcomes of the current analysis in comparison with the gaps and overlaps that were highlighted in the previous analysis (Miranda and Nakashole, 2012). To strengthen longitudinal interpretation, a summary comparison table (Table X) has been added to systematically illustrate structural changes across 2005 → 2015 → 2023, including reduction of redundancies, introduction of new competencies, and shifts in cognitive demand levels. This visual representation clarifies reform trends and makes progression more explicit. In addition, Bloom's Taxonomy is used to assess the cognitive levels of the learning objectives documented in the current mathematics curriculum for the junior primary phase. This cognitive mapping complements CCA by providing an additional analytical layer to evaluate whether progression reflects increasing intellectual demand rather than simple topic redistribution.

Table 1 provides a comparative summary of how core competencies in Number Concept Development are addressed in Grades 1–3 in the 2012 and 2025 curriculum reviews. The symbol "C" indicates that a topic is clearly and comprehensively covered at that grade level; "₵" indicates partial or limited coverage (i.e., the concept is mentioned but lacks depth or progression); and "NA" indicates that the topic is not addressed at that grade level. The table reveals strong continuity in foundational areas such as counting, number notation, regrouping, and the four basic operations, which are consistently covered across all grades. However, important conceptual areas such as place value, estimation, and mental arithmetic show partial coverage, suggesting limited conceptual depth. Advanced structural components, such as order of operations, properties of operations, and percentages, remain absent, indicating persistent gaps in early conceptual scaffolding. These patterns are central to assessing whether curriculum reforms have strengthened foundational numeracy progression or merely maintained surface-level coverage.

Table 1: The Coverage of Number Concept Development in the JP Mathematics Curriculum

Namibian Mathematics Curriculum Analysis: Coverage of Core Competencies in Major Themes							
Theme	**Topics**	**GRADES (1 – 3) 2012 Review**			**GRADES (1 – 3) 2025 Review**		
		1	**2**	**3**	**1**	**2**	**3**
1. Number Concept Development	1. Counting	C	C	C			
	2. Number Notation	C	C	C			
	3. Types of Numbers	NA	NA	NA			
	4. Place Value	NA	₵	₵			
	5. Subitising	C	C	C			
	6. Doubling and Halving	C	C	C			
	7. Number Pattern	C	C	C			
	8. Regrouping	C	C	C			
	9. Ordering & Comparing	C	C	C			
	10. Decade Numbers	NA	C	C			
	11. Odd & Even Numbers	₵	C	C			
	12. Decomposition of Numbers	₵	C	C			
	13. Fractions	₵	C	C			
	14. Estimation	₵	₵	₵			
	15. Four Basic Operations	C	C	C			
	16. Order of operations	NA	NA	NA			
	17. Properties of Operations	NA	NA	NA			
	18. Multi-step Problems	C	C	C			
	19. Mental Arithmetic	₵	₵	₵			
	20. Percentages	NA	NA	NA			

Table 2 compares the coverage of Measurement and Mensuration topics across the two curriculum reviews. As in Table 1, "C" denotes comprehensive coverage, "₵" indicates partial coverage, and "NA" reflects the absence of the topic. The findings show consistent emphasis on basic measurement concepts such as measuring, time, and money across Grades 1-3. However, more conceptually demanding areas- such as perimeter, area, volume/capacity, and tessellation-remain absent in the junior primary phase. While this may reflect age-appropriateness considerations, the absence of early conceptual exposure may limit progression into upper primary geometry and spatial reasoning. The table, therefore, highlights both coherence in foundational measurement skills and structural limitations in expanding conceptual breadth.

Table 2: The Coverage of Measurement and Mensuration in the JP Mathematics Curriculum

Theme	Topic	GRADES (1 – 3) 2012 Review			GRADES (1 – 3) 2025 Review		
		1	2	3	1	2	3
2. MEASUREMENT & MENSURATION	1. Measuring, comparing and ordering	C	C	C			
	2. Time	C	C	C			
	3. Money	C	C	C			
	4. Perimeter	NA	NA	NA			
	5. Area	NA	NA	NA			
	6. Volume/Capacity	NA	NA	NA			
	7. Tessellations	NA	NA	NA			

Table 3 illustrates the coverage of Money and Finance topics across Grades 1-3. The symbol "C" indicates full inclusion, while "NA" denotes absence. The data show that the curriculum maintains strong coverage of basic financial literacy concepts such as coins and paper money. However, broader financial competencies-including budgeting, profit and loss, interest, tax, and personal finance-are entirely absent. This suggests that financial numeracy remains narrowly defined at the junior primary level. From a curriculum reform perspective, the table demonstrates limited expansion in economic reasoning competencies despite global emphasis on financial literacy as a 21st-century skill.

Table 3: The Coverage of Money and Finance in the JP Mathematics Curriculum2

Theme	Topics	GRADES (1 – 3) 2012 Review			GRADES (1 – 3) 2025 Review		
		1	2	3			
3. MONEY & FINANCE	1. Coins & Paper Money	C	C	C			
	2. Cost & Selling Price	NA	NA	NA			
	3. Profit & Loss	NA	NA	NA			
	3. Currency Conversions	NA	NA	NA			
	4. Personal & Household Finance	NA	NA	NA			
	5. Interest	NA	NA	NA			
	6. Tax	NA	NA	NA			
	7. Budgeting	NA	NA	NA			

Table 4 presents the coverage of Geometry-related topics across the two review periods. The coding symbols remain consistent with previous tables. The analysis indicates that geometrical figures are consistently covered across Grades 1-3. However, more advanced spatial reasoning concepts-such as symmetry, angles, geometric constructions, and relationships-are not addressed at this level. While developmental appropriateness may justify limited abstraction, the absence of structured progression toward relational geometric thinking suggests a potential gap in conceptual scaffolding. The table, therefore, reflects a curriculum that prioritises recognition of shapes over deeper spatial reasoning competencies.

Table 4: The Coverage of Geometry in the JP Mathematics Curriculum

Theme	Topics	GRADES (1 – 3) 2012 Review			GRADES (1 – 3) 2025 Review		
		1	2	3			
4. Geometry	1. Geometrical Terms and Relationships	NA	NA	NA			
	2. Geometrical Figures	C	C	C			
	3. Geometric Constructions	NA	NA	NA			
	4. Symmetry	NA	NA	NA			
	5. Locus	NA	NA	NA			
	6. Angles	NA	NA	NA			
	7. Angle Properties	NA	NA	NA			

Table 5 compares coverage of Data Handling competencies across the two curriculum versions. Core skills-data collection, representation, and interpretation-are consistently covered across Grades 1-3, reflecting structural coherence in this strand. However, probability remains absent. Although probability is often introduced later in schooling, its absence indicates that early intuitive reasoning about chance and uncertainty is not formally developed. Overall, the table shows relative strength in foundational statistical literacy but limited extension into probabilistic reasoning.

Table 5: The Coverage of Data Handling in the JP Mathematics Curriculum

Theme		GRADES (1 – 3) 2012 Review			GRADES (1 – 3) 2025 Review		
	Topics	1	2	3	1	2	3
5. Data Handling	1. Data Collection	C	C	C			
	2. Data Representation	C	C	C			
	3. Data Interpretation	C	C	C			
	4. Probability	NA	NA	NA			

Table 6 displays the coverage of Algebra topics within the junior primary curriculum. All listed algebraic competencies-including algebraic representation, manipulation, and equations-are marked as "NA," indicating complete absence across Grades 1-3. While formal algebra is typically introduced in later grades, contemporary mathematics education literature emphasises the importance of early algebraic thinking through pattern generalisation and relational reasoning. The absence of explicit algebraic strands suggests that algebraic foundations are implicitly embedded within number patterns rather than systematically developed, representing a potential structural limitation in long-term progression.

Table 6: The Coverage of Algebra in the JP Mathematics Curriculum

Theme	Topics	GRADES (1 – 3) 2012 Review			GRADES (1 – 3) 2025 Review		
		1	2	3	1	2	3
6. Algebra	1. Algebraic Representation & Formulea	NA	NA	NA			
	2. Algebraic Manipulation	NA	NA	NA			
	3. Equations & Inequalities	NA	NA	NA			

Table 7 outlines the coverage of Trigonometry-related concepts. As expected at the junior primary level, all trigonometric topics are marked “NA.” This reflects developmental appropriateness rather than a curriculum deficiency. The table is included primarily to demonstrate the scope boundaries of junior primary mathematics and to confirm that higher-order spatial and trigonometric reasoning is not prematurely introduced.

Table 7: The Coverage of Trigonometry in the JP Mathematics Curriculum

Theme	Topics	GRADES (1 – 3) 2012 Review			GRADES (1 – 3) 2025 Review		
		1	2	3	1	2	3
7. Trigonometry	1. Right-angled Triangles	NA	NA	NA			
	2. Trigonometric Ratios	NA	NA	NA			
	3. Bearings	NA	NA	NA			

Table 8 presents the coverage of Problem Solving across Grades 1-3. “C” indicates consistent integration, while “NA” indicates absence. The table shows that problem-solving is reportedly embedded throughout the curriculum. However, without explicitly defined word problems, the extent and authenticity of applied mathematical reasoning activities remain uncertain. Given that problem-solving is central to contemporary mathematics reform, this pattern suggests that while the curriculum claims integration, explicit structural articulation of problem-solving strategies may be limited. This distinction is critical to evaluating whether reform efforts genuinely strengthen higher-order thinking or merely retain procedural emphasis.

Table 8: The Coverage of Problem Solving in the JP Mathematics Curriculum

Topic: Problem Solving	GRADES (1 – 3) 2012 Review			GRADES (1 – 3) 2025 Review		
	1	2	3	1	2	3
1. Problems throughout	C	C	C			
2. Word problems	NA	NA	NA			

This follow-up analysis reveals that while previous reforms improved content alignment with developmental milestones and introduced clearer progression across grades, a few challenges still remain. These include insufficient teacher training, inadequate teaching and learning media, and persistently slow curriculum adaptation to diverse classroom contexts.

Discussion

The revised 2015 and 2023 Namibian Junior Primary Mathematics Curriculum demonstrates progress in mitigating previously identified gaps. Notably, the inclusion of estimation and problem-solving activities aligns with recommendations from earlier evaluations (Miranda & Nakashole, 2013). For example, estimation, previously minimally articulated in the 2005 syllabus, is now explicitly referenced across Grades 1–3; however, Table 1 indicates that its coverage remains partial (₵) rather than comprehensive, suggesting limited depth and progression. Similarly, problem-solving is described as integrated "throughout" the curriculum (Table 8), yet the absence of explicitly structured word problems or graded problem-solving strategies raises concerns about the authenticity of its integration. However, persistent deficiencies remain in areas such as mental mathematics and place value understanding. As shown in Table 1, mental arithmetic is marked as partially covered (₵) across all three grades, with no clear indication of increasing complexity from basic recall to strategic computation. Likewise, place value is absent in Grade 1 (NA) and only partially addressed in Grades 2 and 3 (₵), without explicit articulation of expanded notation, base-ten reasoning, or decomposition strategies beyond surface recognition.

These foundational skills are critical for numeracy development, as emphasised by Laski et al. (2015), who highlight the importance of early number sense in mathematical proficiency. The persistence of these gaps suggests that curriculum revision alone may not sufficiently address deeply embedded structural and pedagogical weaknesses. One possible explanation is that while content statements have been revised, insufficient instructional guidance, limited exemplar materials, and constrained teacher preparation may hinder effective classroom enactment. Without explicit scaffolding of mental computation strategies and expanded treatment of place value across grades, learners risk developing fragmented number concepts, which research associates with later difficulties in multi-digit operations and algebraic reasoning.

The revised 2015 and 2023 curricula exhibit improved vertical alignment, reducing redundancies observed in the 2005 version. For instance, the staggered introduction of addition and subtraction with regrouping across Grades 2 and 3 reflects Tyler's (1949) principle of sequential learning. For example, Table 2 shows that "measuring, comparing and ordering" appears comprehensively (C) across all three grades without clearly differentiated complexity indicators. Similarly, in Table 5, data collection, representation, and interpretation are marked as comprehensively covered (C) across Grades 1–3, yet curriculum descriptors do not consistently specify increasing cognitive demand (e.g., moving from pictographs to scaled bar graphs or from literal interpretation to inferential reasoning). Despite these improvements, some overlaps persist, particularly in measurement and data handling strands, indicating a need for further refinement to ensure content progression and avoid repetition. If conceptual progression within these strands remains limited to recognition and simple representation tasks, learners may experience repetition without cognitive advancement, which can contribute to disengagement and shallow conceptual mastery. This highlights the importance of systematically mapping not only topic recurrence but also cognitive complexity across grade levels.

The curriculum's emphasis on practical applications and learner-centred approaches suggests a shift towards constructivist pedagogy, consistent with Kriek and Grayson's (2009) advocacy for experiential learning in mathematics. For instance, references to real-life contexts in money and measurement strands (Tables 2 and 3) demonstrate attempts to situate learning within familiar environments such as time-telling and currency use. However, the limited focus on higher-order thinking skills, such as reasoning and justification, indicates an area for development. Incorporating tasks that promote critical thinking and problem-solving can enhance conceptual understanding and align with Kilpatrick et al.'s (2001) framework for mathematical proficiency. Although number patterns are comprehensively included (C) across Grades 1–3 (Table 1), there is a limited explicit requirement for learners to justify pattern rules or generalise relationships algebraically. Likewise, while multi-step problems are marked as covered (C), curriculum descriptors emphasise procedural completion rather than explanation of strategies or comparison of solution methods. The limited presence of reasoning tasks may reflect cautious curriculum design aimed at ensuring foundational coverage; however, international evidence indicates that early exposure to reasoning strengthens rather than delays conceptual mastery. Without deliberate integration of justification, explanation, and multiple-solution strategies, the curriculum may continue to privilege procedural fluency over adaptive expertise.

While the curriculum references competencies like problem-solving and reasoning, their integration into learning outcomes and instructional activities is inconsistent. For example, the curriculum frequently uses verbs such as “solve,” “identify,” and “calculate,” but rarely includes verbs such as “justify,” “explain why,” “compare strategies,” or “prove,” which signal higher-order reasoning expectations. Additionally, Table 6 shows a complete absence (NA) of explicit algebraic representation and equations, limiting early algebraic reasoning development despite comprehensive coverage of number patterns. Voogt and Roblin (2012) emphasise the necessity of embedding 21st-century skills into curricula to prepare learners for contemporary challenges. The lack of explicit strategies for developing these skills suggests a disconnect between policy aspirations and practical implementation. This disconnect may stem from a policy-driven reform model in which competency language is adopted at the macro level without sufficient translation into micro-level curriculum descriptors and teacher guidance. Addressing this requires clearer performance descriptors, illustrative tasks, and structured exemplars demonstrating how competencies such as reasoning and collaboration can be operationalised in daily lessons.

The revised curriculum presents clearer learning objectives and improved coherence across topics. However, the alignment between curriculum content and assessment practices remains weak. Although problem-solving is described as integrated, assessment guidance does not consistently provide exemplars of rubric-based evaluation for reasoning or conceptual explanation. Moreover, cognitive demand indicators used in this study reveal that many objectives remain concentrated at recall and procedural application levels rather than analysis or reasoning levels. Pinar (2012) notes that effective curriculum reform requires congruence between instructional goals and evaluation methods. Providing teachers with comprehensive assessment guidelines and exemplars can bridge this gap and support effective teaching practices. Actionable implications include: (1) the development of structured assessment blueprints aligned with curriculum strands; (2) targeted professional development workshops focusing on mental mathematics and place value pedagogy; (3) revision of teacher education coursework to strengthen conceptual teaching approaches; and (4) periodic curriculum audits using CCA and cognitive demand analysis to monitor progression and prevent re-emergence of gaps and overlaps. For policymakers, strengthening curriculum–assessment alignment and investing in sustained teacher capacity-building may be more impactful than further structural revisions alone. For teachers, clearer instructional exemplars and differentiated tasks could support deeper conceptual engagement and improved learner outcomes.

5.0 CONCLUSION AND RECOMMENDATIONS

Conclusion: This study set out to evaluate the extent to which the 2015 reform of Namibia's Junior Primary Mathematics Curriculum addressed previously identified gaps and overlaps. The findings suggest that while the curriculum has made progress in aligning content with learners' developmental stages, national priorities, and foundational numeracy skills, several critical areas still require improvement. The revised curriculum demonstrates better sequencing and reduced redundancy in some strands. However, conceptual depth, integration of 21st-century skills, and assessment alignment remain areas of concern. The curriculum's effectiveness is also limited by insufficient teacher support and inconsistent implementation strategies, particularly in under-resourced schools. The persistent gaps - such as limited focus on mental computation, reasoning, and place value - risk undermining learners' long-term mathematical proficiency. The study affirms that curriculum transformation must be an iterative process, continually informed by research, classroom realities, and teacher feedback.

In synthesis, the reform has successfully reduced major structural overlaps evident in the 2005 curriculum and improved vertical alignment between Grades 1–3. It has partially addressed earlier gaps through the introduction of estimation, clearer problem-solving competencies, and improved sequencing of number operations. However, foundational conceptual gaps, particularly in mental mathematics, depth of place value understanding, cognitive demand progression, and curriculum–assessment alignment, remain insufficiently resolved. Thus, while structural coherence has improved, substantive conceptual strengthening is still required to ensure sustainable gains in early numeracy outcomes.

Recommendations: The study recommends that targeted in-service training be provided to teachers, particularly in under-emphasised areas such as mental arithmetic, number patterns, and place value. Professional development initiatives should adopt continuous, context-responsive models such as cluster-based learning communities or lesson study approaches to ensure sustained impact. Workshops should incorporate model lesson demonstrations on mental computation strategies, including number talks, decomposition techniques, and flexible regrouping. They should also provide structured practice on teaching place value through the use of manipulatives and visual representations, alongside peer-observation cycles aimed at promoting pedagogical consistency and reflective practice. The curriculum should further integrate richer mathematical tasks and inquiry-based activities that promote higher-order thinking, problem-solving, and reasoning skills essential for twenty-first-century learning. Curriculum guides could, for instance, include open-ended problem scenarios that allow for multiple solution strategies, real-life data interpretation tasks grounded in local community contexts, and structured reasoning prompts requiring learners to explain and justify their answers both orally and in writing.

Clear and coherent assessment standards aligned with the revised learning outcomes should also be developed. Teachers need structured training in both formative and summative assessment strategies that prioritise conceptual understanding alongside procedural fluency. This may involve providing exemplar rubrics for reasoning-based tasks, developing item banks organised according to Bloom's Taxonomy levels, and offering practical guidance on formative assessment techniques such as exit tickets, diagnostic quizzes, and learner self-assessment practices. Regular content audits across grade levels are necessary to ensure progression that is coherent, age-appropriate, and free from unnecessary repetition. Establishing systematic feedback mechanisms would enable early identification of curriculum misalignments. Such audits could employ Curriculum Content Analysis (CCA) matrices and cognitive demand mapping tools at five-year intervals to monitor topic sequencing, track conceptual development, and detect redundancies or emerging gaps.

Strengthening connections between mathematics and other subject areas, including environmental science, technology, and local cultural studies, would enhance relevance and learner engagement. This may involve designing interdisciplinary, project-based tasks such as measuring rainfall within environmental studies, applying budgeting skills in entrepreneurship themes, or exploring mathematical patterns embedded in local cultural artefacts to promote contextualised numeracy. Finally, longitudinal research should be conducted to determine the actual impact of the revised curriculum on both learner achievement and teacher practice. Classroom-based studies can offer detailed insights into implementation processes, challenges, and successes. Tracking learner cohorts from Grade 1 to Grade 3 would enable evaluation of progression in mental mathematics, reasoning ability, and conceptual understanding, while also examining instructional practices through lesson observations and assessment analyses.

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