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AN ANALYTICAL STUDY OF THE DEVELOPED NATIONAL CHILDHOOD CURRICULUM IN SAUDI ARABIA AND ITS ALIGNMENT WITH COMMON CORE STATE STANDARDS (CCSS) IN MATHEMATICAL CONCEPTS

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ABSTRACT

This study analyzed the content of Saudi Arabia's developed national early childhood curriculum and examined its alignment with the Common Core State Standards (CCSS) in mathematical concepts. Employing a content analysis methodology, the study assessed curriculum components in a systematic and objective manner. Results indicated a high level of alignment between the developed national curriculum and CCSS mathematics standards for early childhood, with an overall mean of 2.691 (89.68%). Standards for counting and cardinality, measurement, and geometry demonstrated the strongest alignment, while number operations and base-ten concepts showed comparatively lower alignment. The findings suggest that while the developed curriculum reflects substantial efforts to align with international standards while remaining developmentally appropriate, opportunities exist for enhancement in more complex mathematical domains.

KEYWORDS: Early Childhood, Mathematical Concepts, Curriculum Alignment, Common Core State Standards (CCSS), Content Analysis, A Pre-School Child, Saudi Arabia

1. INTRODUCTION

Early childhood is foundational for formal education, with mathematics fostering cognitive growth and academic readiness (Breive, 2019). Core mathematical concepts underlie all math domains and many disciplines (Ahmed, 2014; Smith & Sherin, 2019), while skills involve procedural application (Rittle-Johnson et al., 2017), and generalizations connect concepts (Cai et al., 2018). These concepts support future learning and creativity (Wu et al., 2022; Marai, 2020). Societies are in desperate need of creative aspects since one of the most significant drivers of innovation and progress is the ability to think outside the box. Creativity fosters problem-solving, encourages adaptability, and fuels cultural expression, ultimately enriching the human experience and enabling communities to thrive in an ever-changing world. (El-Zahaer, N.E.S.A. et al. 2025)

Children acquire concepts through guided play and structured activities (Al-Ruqi & Al-Jaeed, 2021; Atifi & Al-Meligy, 2015), requiring appropriate pedagogies (Qargash, 2019). Effective learning involves conceptual materials, targeted games, and math centers with supportive environments (Ongoren & Yazlik, 2019).

Creating comprehensive and engaging early mathematics experiences is essential. Research supports integrating play-based and developmentally appropriate methods with formal instruction (Bassok et al., 2016; Bassok, Claessens, & Engel, 2014; Clements & Sarama, 2020; Pondiscio, 2015).

Developmental experts affirm young children's capacity for meaningful mathematical engagement, contingent on pedagogical approach, instructional quality, and contextual relevance (Katz, 2015; Snow & Pizzolongo, 2014, p. 15). In the digital age, connecting concepts to real-life experiences through simplified, authentic representations is critical (Shafi'i, 2013). Educational literature emphasizes holistic developmental approaches during this formative stage (Al-Sherbini, Al-Zahar, & Al-Moussa, 2018).

Within Saudi Arabia's strategic education initiatives, early childhood has become a developmental priority, with curricula aligned to international standards to enhance foundational mathematical competencies (Saudi Ministry of Education, 2018). The systematic evaluation of educational content against established international standards has become increasingly important in ensuring curriculum quality and effectiveness. Recent research in the Saudi context has demonstrated the value of rigorous content analysis

methodologies in assessing curriculum alignment with international frameworks, as evidenced by Al-Quraishi and Alzahrani's (2025) evaluation of digital educational content using standardized criteria. This analytical approach provides a robust model for examining curriculum quality and standard compliance across educational levels and disciplines. Consequently, aligning the reformed curriculum with global benchmarks such as the Common Core State Standards (CCSS) is vital.

The CCSS outline grade-specific goals for mathematics and English language arts and are widely adopted across U.S. states and internationally (Allensworth, Cashdollar, & Cassata, 2022). Experts recognize CCSS as a robust framework that promotes deep conceptual understanding and cultivates critical thinking and problem-solving skills (Schmidt & Burroughs, 2015).

This study conducts a content analysis of mathematical concepts in the reformed national curriculum to assess developmental appropriateness and instructional quality in relation to the CCSS framework.

1.1. Study Problem

This study analyzes mathematical concepts in the reformed national curriculum and assesses their alignment with the Common Core State Standards (CCSS). The research problem arises from five key dimensions:

First, prior studies report deficiencies in early mathematical concept development. Saad (2021) noted that mathematics is often introduced using materials not specifically designed for instruction. Abdel Moneim (2019) identified gaps in the Reggio Emilia curriculum regarding mathematics, underscoring the need for authentic, developmentally appropriate approaches.

Second, research has revealed critical omissions in curriculum standards. Qasim and Abdel Aboudi (2014) found gaps in promoting inquiry and critical thinking. Al-Ghamdi and Al-Tamimi (2018) reported insufficient integration of technology standards and limited use of digital tools. Al-Maliki and Al-Maliki (2021) noted that, despite including many quality criteria, middle school curricula lacked coherence in connecting math concepts to real-world applications. Al-Zaboun (2015) emphasized the need to adapt the interactive national curriculum to early childhood, recommending curriculum committees with specialized expertise.

Third, scholars stress the importance of aligning national curricula with global benchmarks. Khamis (2017) called for linking mathematical content with

early childhood standards, while El-Sherbiny et al. (2018) highlighted the need to evaluate strengths and weaknesses of current math content to guide effective curriculum reform.

Fourth, aligning curricula with international standards is essential for improving mathematics instruction. Hemmi et al. (2018) emphasized that analyzing mathematical concepts enables identification of gaps between national and international standards, supporting the development of more effective pedagogies.

Fifth, strengthening foundational math skills in early childhood is a key priority. Moss et al. (2015) highlighted the importance of building core mathematical concepts during early development, noting that alignment with global benchmarks such as the CCSS significantly supports this goal.

In light of these points, this study examines the compatibility between mathematical concepts in the reformed national curriculum and the Common Core State Standards, aiming to offer curriculum development recommendations aligned with international benchmarks.

The central research question guiding this investigation is: To what extent do the mathematical concepts in the cognitive processes guide of the reformed national curriculum align with the Common Core State Standards for early childhood mathematics?

This primary question leads to the following sub-questions:

1. To what extent do counting and number operations concepts align with the CCSS?
2. How well do operations and algebraic thinking concepts align with the CCSS?
3. What is the degree of alignment between number system and decimal operations concepts and the CCSS?
4. To what extent do measurement and data concepts align with the CCSS?
5. How well do geometry concepts align with the CCSS?

1.2. Study Objectives:

Primary Objective: To analyze the alignment between mathematical concepts in the cognitive processes guide of the reformed national curriculum and the Common Core State Standards (CCSS) for early childhood mathematics.

1.2.1. Secondary Objectives:

1. To assess the degree of alignment between counting and number operations concepts and the CCSS.

2. To evaluate the concordance between operations and algebraic thinking concepts and the CCSS.
3. To examine the compatibility between number system and decimal operations concepts and the CCSS.
4. To determine the alignment between measurement and data concepts and the CCSS.
5. To analyze the correspondence between geometry concepts and the CCSS.

1.3. Significance of Study:

1. Conduct a comprehensive comparative analysis of mathematical concepts in the developed national curriculum and international core standards for early childhood, enriching the Arabic literature and providing a reference for researchers and curriculum developers.
2. Emphasize the importance of aligning national curricula with international standards to help curriculum developers and policymakers identify gaps and enhance curriculum development.
3. Offer an analytical perspective on the status of mathematical concepts in the national curriculum, identifying strengths and weaknesses, and provide practical recommendations to improve teaching practices, fostering deeper understanding among teachers and contributing to professional development.
4. Provide a foundation for designing more effective evaluation tools, enhancing the quality of mathematics education in early childhood.
5. Strengthen global collaboration in math curriculum development, integrating life skills and mathematical concepts to enhance children's practical application of these concepts.

1.4. Study Limitations

This investigation was circumscribed by specific parameters to ensure methodological rigor and contextual relevance. The research scope was limited to mathematical concepts embedded within the reformed national curriculum for early childhood education, with analysis conducted through the analytical framework provided by the Common Core State Standards (CCSS). Spatially, the study focused exclusively on mathematical concept content within the early childhood national curriculum documents. Temporally, the research was conducted during the

second semester of the 2023/2024 academic year, thus reflecting curriculum materials and current standards during this period. These boundaries were established to provide focused analysis while acknowledging the dynamic nature of curriculum development and international educational standards.

1.5. Research Terminology:

Content Analysis: A systematic approach used to examine the Cognitive Processes Guide within the national curriculum, identifying and categorizing mathematical concepts and assessing their alignment with international early childhood mathematics standards.

Mathematical Concepts: Abstract mathematical ideas introduced to early learners through the national curriculum, including numerical and geometric concepts, analyzed to assess their conformity with international standards.

Common Core State Standards (CCSS): An American standards framework used in this study to evaluate mathematical concepts in the national curriculum, covering early childhood topics such as geometry, measurement, data analysis, numerical operations, counting, and algebraic thinking.

Developed Curriculum: The official educational framework in Saudi Arabia, designed for early childhood mathematics instruction, serving as the primary focus for evaluating its alignment with international standards.

Early Childhood: The developmental stage from ages three to six, encompassing preschool years, which constitutes the target population for analyzing the alignment of mathematical concepts with international standards.

A pre-school child: This stage begins when the infantile phase ends at around two years of age and extends until the onset of sexual maturity. Childhood is divided into two parts: the first is the preschool stage, which occurs between the ages of two and six, and the second is late childhood, which spans from six to about twelve years of age.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW:

2.1. Content Analysis

Content analysis is a systematic, objective method for inferring meaning from texts (Krippendorff, 2018; Moffett & Weare Jr., 2020), involving structured, quantitative transformation of qualitative data (Mayring, 2019). It serves to analyze message traits, motives, impacts, and persuasive strategies (Roller & Lavrakas, 2015), offering deep insight into content,

sociocultural shifts, and educational materials (Moleko, 2022).

It is flexible, non-intrusive, cost-effective, and supports longitudinal studies (Drisko & Maschi, 2016), with uses in social media and curriculum analysis (Lucas et al., 2015; Tatlıoğlu, 2019; Kim, 2021). Limitations include objectivity challenges, time demands, and difficulty analyzing digital media (Stemler, 2015).

2.2. Mathematical Concepts for Early Childhood

Mathematical concepts are vital for early scientific understanding (Atefi & El-Melegy, 2015), including categorization, symmetry, counting, and shapes (Bakhit, Sayed, & Maqbool, 2022), supporting cognition and problem-solving through brain-based learning. Concepts fall into sensory-based (primary) and abstract (secondary) categories—spanning space, volume, number, and measurement (Marai, 2020)—and develop progressively, re-lying on prior knowledge. Saudi curricula incorporate global standards (Al-Sherbiny et al., 2018).

Theories informing math learning include Piaget (environmental interaction), Bruner (structure visualization), Janet (self-directed learning), Deans (sensory input), and Vygotsky (social cognition), with Reggio Emilia shown effective in life-context concept development (Abdel Moneim, 2019).

Technology enhances instruction, especially for children with disabilities, via digital storytelling (Al-Otaibi, 2021). Integration of tech standards is vital (Al-Ghamdi & Al-Tamimi, 2018), alongside textbook analysis (Chang & Silalahi, 2017) and content expansion (Engel et al., 2016).

Curricula must meet diverse needs, including children with hearing impairments (Al-Zaytoun, 2015). Al-Saidi (2018) identified core concepts and validated programs tailored to developmental standards.

3. INTERNATIONAL CORE STANDARDS (COMMON CORE STATE STANDARDS, CCSS)

The Common Core State Standards (CCSS) define grade-specific expectations in math and English, emphasizing deep understanding, critical thinking, and problem-solving (Allensworth, Cashdollar, & Cassata, 2022). Key features include focus on fewer topics (Polikoff, 2014), concept interconnection (Daro et al., 2011), rigor (Core, 2010), real-world application (Zimba, 2014), and eight mathematical practices (Bernander et al., 2020).

For early learners, CCSS covers five domains:

counting, algebraic thinking, fractions, measurement, and geometry, structured cumulatively (Clements et al., 2016). Critics cite age-inappropriateness (Polleck & Jeffery, 2017) and test-driven concerns (Ravitch & Stoehr, 2017), yet many affirm its instructional value (Schmidt & Burroughs, 2015).

Content analysis enables curriculum evaluation aligned with developmental needs and global benchmarks. CCSS supports conceptual mastery and thinking skills, serving as a benchmark for curriculum assessment.

This study uses content analysis to evaluate the national curriculum's alignment with core standards and its relevance to kindergarten mathematics.

3.1. Method Participants and Procedure

First: Study Methodology:

To fulfill the study's aims, a content analysis technique was tailored to its variables. Content analysis is the act of dividing text into smaller components that may be analysed (Krippendorff, 2018). The deconstruction may be physical, as in the scientific sciences, or conceptual, as in the human sciences.

The content analysis approach has a few key features. According to Çay and Kalkamanova (2023), the text encompasses both substantive and formal elements. Second, it examines repeating words, concepts, symbols, and hidden meanings in the text (Mayring, 2020).

Objectivity and impartiality must be maintained throughout the analytical process, as well as a methodical and ordered approach (Schreier, 2012). This systematic strategy aids in the achievement of consistent and reproducible outcomes, hence increasing the study's validity and dependability.

Second: procedures for the analytical examination of mathematical concepts in the national curriculum prepared in line with The International Common Core State Standards:

1. **Literature review:** Review previous studies and research, Arab and foreign, related to mathematical concepts in early childhood curricula and international standards Common Core State Standards, with the aim of developing study tools and enriching the theoretical framework.
2. **Develop the analysis tool:** Create a content analysis framework for the developed national curriculum, which is based on the worldwide Common Core State Standards for early childhood mathematics. This contains essential areas: counting and arithmetic operations,

algebraic reasoning, numbers and decimal operations, measurement and statistics, and geometry (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

3. **Tool review:** Present the analysis form to a group of experts and specialists in educational psychology, curricula and teaching methods for early childhood, and mathematics education to ensure its validity and stability, as well as its coverage of basic mathematical concepts in accordance with international standards.
4. **Modify the tool:** make the necessary amendments to the analysis form based on the arbitrators' comments, and prepare it in its final form.
5. **Content analysis:** The two researchers conducted a comprehensive analysis of the content of the developed national curriculum in light of the prepared analysis form, focusing on the mathematical concepts included.
6. **Analysis of results:** Identify the strengths and weaknesses of the developed national curriculum with regard to mathematical concepts, compared to the international Common Core State Standards.
7. **Offer recommendations:** Establish a recommended vision for the mathematical skills and concepts that should be included in the national curriculum for the early childhood stage, based on international standards and the findings of the current study.

3.2. Study sample:

The study sample was the content of the developed national curriculum for early children (the basic guide, the developed curriculum guide, and the four units: Animals, Buildings, Conductors, and All About Me), with an emphasis on examining the mathematical ideas present. Non-mathematical concepts were removed from the analytical process.

3.3. Measurements

A content analysis form specifically designed for this study. This form is based on the Common Core State Standards for Mathematics in Kindergarten.

The analysis form was designed to evaluate the extent to which mathematical concepts in the developed national curriculum are compatible with these international standards to identify the strengths and weaknesses of the curriculum in relation to early childhood mathematics education.

Within the framework of the analytical study of

mathematical concepts in the national curriculum developed in accordance with the international Common Core State Standards, the validity and reliability of the analysis tool was verified as follows:

1. Validity of the analysis tool: The following procedures were taken to confirm the tool's validity and to reliably assess its intended results:
 - Introduce the instrument to a panel of arbitrators who specialize in early childhood mathematical education, curriculum and teaching methodologies, and educational psychology.
 - The arbitrators were requested to assess the tool's adequacy for examining mathematical ideas in line with international standards, Common Core State Standards.
 - The appropriate modifications were

performed based on the arbitrators' recommendations to increase the tool's content validity.

- The arbitrators unanimously agreed on the tool's validity for examining mathematical content in the developed national curriculum.
2. Reliability of analysis tool was evaluated using the following steps:

The study team conducted an independent analysis of the developed national curriculum content.

- The coefficient of agreement amongst analysts was calculated using Holsti's algorithm (Neuendorf 2018).
- The reliability coefficient was calculated for each dimension of the questionnaire, and the results were as shown in Table (1):

Table 1: Shows A Reliability of The Content Analysis Form's Aspects for the National Early Childhood Curriculum Based On Common Core State Standards.

Standards	Total number of practices	Analysis	Compatibility			Coefficient of agreement
			Applicable	To a certain extent	Not applicable	
Counting and arithmetic operations	9*4 = 36	First	28	5	3	0.92
		Second	30	4	2	
Algebraic thinking	5*4=20	First	15	3	2	0.9
		Second	16	2	2	
Numbers and decimal operations	1*4 = 4	First	3	1	0	1
		Second	3	1	0	
Measurement and data	3*4=12	First	9	2	1	0.92
		Second	10	1	1	
Geometry	7 * 4 = 28	First	22	4	2	0.93
		Second	23	3	2	
Overall Rate	25 * 4 = 100	First	77	15	8	0.92
		Second	82	11	7	

These results indicate a high level of reliability of the analysis tool, confirming its validity for use in this study.

Statistical processing and content validity analysis:

The following processes were used to process and evaluate the data following a thorough examination of the national curriculum created in compliance with the Common Core State Standards for mathematics in early childhood education:

1. **Data classification:** The results of the content analysis were transcribed into organized tables, using a three-tiered scale to evaluate the availability of mathematical concepts:
 - (3) marks: The concept matches the content of the curriculum
 - (2) marks: The concept matches the content of the curriculum to some extent
 - (1) mark: The concept does not match
2. **Data entry:** After the data were de-identified,

they were carefully reviewed to guarantee that the information was accurate and legitimate before being entered into a suitable statistical analysis package.

3. **Statistical analysis:** A quantitative analysis was conducted using SPSS software, employing descriptive statistics including frequency distribution, percentages, means, and standard deviations to evaluate mathematical concept representation in the curriculum. The assessment utilized a three-point Likert scale (1="not applicable", 2="to some extent", 3="applies") with interval ranges of 0.67 calculated by dividing the scale range (2) by the number of categories (3). This methodological approach enabled systematic evaluation of concept prevalence and relative importance within the national curriculum framework, as shown in Table (2):

Table 2: Periods for Determining The Availability According to a Three-Way Likert Scale.

Limits of arithmetic mean	Degree of availability
1- 1.67	Low
1.68- 2.33	Medium
2.34- 3	High

In order to identify the curriculum's strengths and weaknesses with regard to early childhood mathematics education, these procedures seek to provide an accurate quantitative analysis of the degree to which mathematical concepts in the developed national curriculum align with the international Common Core State Standards (Sarama & Clements, 2009).

4. RESULTS

The main study examined the alignment between

Table 3: Frequencies, Arithmetic Mean, Standard Deviation, Percentage, and Availability The Indicator of Identifying the Names of Numbers and How To Count in The Developed National Curriculum.

Practice	Applicable	To some extent	Not applicable	Mean	Standard Deviation	Percentage	Availability
Learning how to count from 1 to 100 and related operations	3 (0.75%)	1 (0.25%)	0 (0%)	2.75	0.5	91.67%	High
Counting upwards from a given number for the child	3 (0.75%)	1 (0.25%)	0 (0%)	2.75	0.5	91.67%	High
Writing numbers from 0 to 20 and representing them with tangible objects	4 (1%)	0 (0%)	0 (0%)	3	0	100%	High

The results presented in Table 3 show that the practices for teaching number recognition and counting in the developed national curriculum are largely deemed applicable. The practices of learning to count from 1 to 100 and counting upwards from a given number both had high applicability, with 91.67% of respondents confirming their relevance, reflected in a mean score of 2.75 and a low standard

1. Indicator of counting realia:

Table 4: Shows Frequencies, Arithmetic Mean, Standard Deviation, Percentage, And Availability The Indicator Of Counting Realia In The Developed National Curriculum.

Practice	Applicable	To some extent	Not applicable	Mean	Standard Deviation	Percentage	Availability
Linking counting with enumeration by expressing quantity abstractly	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High
Recognizing the final number that represents the result of addition, subtraction, multiplication, or division	2 (50%)	2 (50%)	0 (0%)	2.5	0.58	83.33%	Moderate

mathematical concepts in Saudi Arabia's developed national curriculum and the international Common Core Standards for early childhood mathematics. Using frequencies, percentages, means, and standard deviations (based on a three-point Likert scale), the analysis specifically addressed the compatibility of concepts including counting, enumeration, integer operations, algebraic thinking, decimal operations, and geometry.

The first research question focused specifically on how well counting concepts in the cognitive processes guide aligned with international standards. Content analysis was conducted across four curriculum units (animal, buildings, connectors) to determine alignment levels between the early childhood curriculum and international core standards for counting, enumeration, and number operations. 1- Identifying the names of numerals and counting indicator.

deviation of 0.5. The practice of writing numbers from 0 to 20 and representing them with tangible objects received unanimous approval, with 100% of respondents indicating its applicability and a perfect mean score of 3.0. These findings highlight the strong alignment of the curriculum with effective number recognition and counting practices, particularly in the use of tangible objects for teaching.

Understanding that consecutive numbers represent quantities beyond one	2 (50%)	2 (50%)	0 (0%)	2.5	0.58	83.33%	Moderate
Ability to answer questions about the result	1 (25%)	3 (75%)	0 (0%)	2.25	0.5	75%	Moderate

The results in Table 4 reflect varying levels of applicability for different counting practices in the developed national curriculum. The practice of linking counting with enumeration by expressing quantity abstractly was unanimously considered applicable, receiving a perfect mean score of 3.0 and 100% availability, indicating its high relevance. In contrast, the practices of recognizing the final number representing the result of basic arithmetic operations, understanding consecutive numbers, and answering questions about results were all viewed as moderately applicable, with mean scores ranging from 2.25 to 2.5 and availability percentages of 75% to 83.33%. These results suggest that while some practices, such as abstract enumeration, are fully integrated into the curriculum, others, like recognizing and understanding arithmetic results, show more mixed levels of application.

3. Indicator of comparison between numbers:

Table 5: Shows Frequencies, Arithmetic Mean, Standard Deviation, Percentage, And Availability The Indicator Of Comparison Between Numbers In The Developed National Curriculum.

Practice	Applicable	To some extent	Not applicable	Mean	Standard Deviation	Percentage	Availability
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Comparing numbers	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High
Comparing two numbers or digits between 1 to 10	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High

Table 5 indicates that both practices related to number comparison are fully applicable in the developed national curriculum. The practice of comparing numbers and comparing two numbers or digits between 1 to 10 received perfect scores, with 100% of respondents affirming their applicability. Both practices achieved a mean score of 3.0 and showed no variation (standard deviation of 0), suggesting that these number comparison activities are highly relevant and consistently integrated into the curriculum. Furthermore, both practices were rated as having high availability, reflecting their widespread use and importance in the curriculum.

The second research question assessed how well operations and algebraic thinking concepts in the Cognitive Operations Guide aligned with international Common Core Standards for early childhood mathematics. Content analysis across four curriculum units (animals, buildings, connectors, and "all about me") evaluated compatibility between mathematical concepts and international standards for operations and algebraic thinking. 1- Indicator of thinking processes related to addition and subtraction

Table 6: Frequencies, Arithmetic Mean, Standard Deviation, Percentage, and Availability the Indicator of Thinking Processes For Addition and Subtraction in The Developed National Curriculum.

Practice	Applicable	To some extent	Not applicable	Mean	Standard Deviation	Percentage	Availability
Understanding the operations of addition and subtraction	2 (50%)	2 (50%)	0 (0%)	2.5	0.58	83.33%	Moderate
Solving addition and subtraction exercises	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High
Analyzing or decomposing numbers equal to or less than 10 through pairs of numbers using multiple methods of solving	1 (25%)	3 (75%)	0 (0%)	2.25	0.5	75%	Moderate
Working with numbers from 1 to 9	1 (25%)	3 (75%)	0 (0%)	2.25	0.5	75%	Moderate
Mastery of addition and subtraction with numbers not exceeding 5	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High

Table 6 reveals that the practices related to arithmetic operations show varying levels of applicability within the developed national

curriculum. The practices of solving addition and subtraction exercises, as well as mastering addition and subtraction with numbers not exceeding 5, were

unanimously deemed applicable, with both receiving a perfect mean score of 3.0 and 100% availability, indicating high relevance and integration in the curriculum. In contrast, understanding the operations of addition and subtraction showed moderate applicability, with a mean score of 2.5 and 83.33% availability. The practices of analyzing or decomposing numbers less than or equal to 10 and working with numbers from 1 to 9 received lower applicability ratings, with mean scores of 2.25 and 75% availability, suggesting that while these practices are included in the curriculum, they are not as widely implemented or emphasized as the other

practices.

The third research question examined the alignment between number and decimal operations concepts in the Cognitive Processes Guide and the international Common Core Standards for early childhood mathematics. Content analysis evaluated how mathematical concepts across four curriculum units (animals, buildings, connectors, and "all about me") corresponded with international standards for number handling and decimal operations in early childhood education. 1- Indicator of handling numbers from 11 to 19

Table 7: Frequencies, Arithmetic Mean, Standard Deviation, Percentage, And Availability the Indicator of Dealing With Numbers From 11 To 19, Presented in the Developed National Curriculum.

Practice	Applicable	To some extent	Not applicable	Mean	Standard Deviation	Percentage	Availability
Addition and decomposition of numbers from 11 to 19	1 (25%)	3 (75%)	0 (0%)	2.25	0.5	75%	Moderate

Table 7 shows that the practice of adding and decomposing numbers from 11 to 19 is considered moderately applicable in the developed national curriculum. With a mean score of 2.25 and 75% availability, this practice is acknowledged by 75% of respondents as somewhat applicable, while 25% found it fully applicable. The standard deviation of 0.5 indicates a slight variation in opinions, suggesting that while this practice is included in the curriculum, its application might not be as widely emphasized or uniformly implemented compared to other practices.

The fourth research question assessed the alignment between measurement and data concepts in the Cognitive Processes Guide of Saudi Arabia's developed national curriculum and the international Common Core Standards for early childhood mathematics. Content analysis across four curriculum units (animals, buildings, connectors, and "all about me") evaluated the extent to which mathematical concepts aligned with international standards for measurement and data in early childhood education. 1- Describe and compare estimated and calculated objects.

Table 8: Shows The Frequency, Arithmetic Mean, Standard Deviation, Percentage, And Availability The Indicator Of Describing Estimated and Calculated Objects and Comparing Them In The Developed National Curriculum.

Practice	Applicable	To some extent	Not applicable	Mean	Standard Deviation	Percentage	Availability
Describing estimated objects and shapes such as lengths, weights, and different units of measurement for the same object or body	1 (25%)	3 (75%)	0 (0%)	2.25	0.5	75%	Moderate
Comparing two shapes or bodies	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High
Classifying objects according to their number or digit into different categories	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High

Table 8 reveals varying levels of applicability for practices related to the comparison, classification, and measurement of objects and shapes in the

developed national curriculum. The practices of comparing two shapes or bodies and classifying objects according to their number or digit received

perfect scores, with 100% applicability and high availability (mean score of 3.0 and standard deviation of 0), indicating their widespread integration and importance in the curriculum. On the other hand, the practice of describing estimated objects and shapes in terms of lengths, weights, and units of measurement showed moderate applicability, with a mean score of 2.25 and 75% availability. This suggests that while the practice is included in the curriculum, its application is not as universally emphasized as the other practices.

The fifth research question evaluated the alignment between geometry concepts in the

Cognitive Processes Guide of Saudi Arabia's developed national curriculum and the international Common Core Standards for early childhood mathematics. Content analysis across four curriculum units (animals, buildings, connectors, and "all about me") assessed the degree to which mathematical geometry concepts aligned with international standards for early childhood education.

1. Recognize and describe many shapes, including squares, circles, triangles, rectangles, octagons, cubes, cones, cylinders, and spheres.

Table 9: Shows The Frequency, Arithmetic Mean, Standard Deviation, Percentage, And Availability The Indicator Of Recognizing And Describing Shapes In The Developed National Curriculum, Including Squares, Circles, Triangles, Circles, Rectangles, Octagons, Hexagons, Cubes, Cones, Cylinders, And Balls.

Practice	Applicable	To some extent	Not applicable	Mean	Standard Deviation	Percentage	Availability
Describing shapes or bodies using their names	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High
Correctly naming shapes or bodies	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High
Identifying two-dimensional and three-dimensional shapes	2 (50%)	2 (50%)	0 (0%)	2.5	0.58	83.33%	Moderate
Analyzing, comparing shapes, and creating and constructing shapes	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High
Constructing and building geometric shapes using various materials such as clay and environmental resources	1 (25%)	3 (75%)	0 (0%)	2.25	0.5	75%	Moderate
Recognizing all objects of the same shapes and sizes in the surrounding environment	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High
Combining simple shapes into larger or more complex shapes	4 (100%)	0 (0%)	0 (0%)	3	0	100%	High

Table 9 shows a high degree of applicability for most practices related to shapes and bodies in the developed national curriculum. Practices such as describing and correctly naming shapes, analyzing and constructing shapes, recognizing identical shapes and sizes in the environment, and combining simple shapes into more complex ones all received perfect scores of 100% applicability and high availability, with mean scores of 3.0 and no standard deviation, indicating their full integration and widespread importance in the curriculum. However, the practice of identifying two-dimensional and three-dimensional shapes, as well as constructing geometric shapes with various materials, were rated moderately applicable, with mean scores of 2.5 and 2.25 respectively, and 75% availability. This suggests

that these practices are present in the curriculum but may not be as universally emphasized or consistently applied as the others.

The researcher concluded the analysis by presenting the consolidated findings for the study's main research question regarding the overall compatibility between mathematical concepts in the Cognitive Processes Guide of Saudi Arabia's developed national curriculum and the international Common Core Standards for early childhood mathematics. Table 10 provides a comprehensive summary of these alignment results across all mathematical concept domains examined.

Table 10: Means, Standard Deviations, Percentage, and Availability of the Indicators.

Indicator	Number of Practices	Arithmetic Mean	Standard Deviation	Percentage	Availability
Counting, inventory, and dealing with integer numbers	9	2.75	0.44	91.67%	High
Operations and algebraic thought	5	2.6	0.5	86.67%	High
Working with numbers and decimal operations	1	2.25	0.5	75%	Medium
Measurement and data concepts	3	2.75	0.45	91.67%	High
Geometry	7	2.75	0.44	91.67%	High
All Indicators	25	2.691	0.46	89.68%	High

Table 10 presents the overall performance of the different indicators in the developed national curriculum. The indicators related to counting, inventory, and dealing with integer numbers, operations and algebraic thought, measurement and data concepts, and geometry all show high applicability, with mean scores ranging from 2.6 to 2.75 and an availability of 91.67%, indicating these areas are highly integrated into the curriculum. The "Working with numbers and decimal operations" indicator scored moderately with a mean of 2.25 and 75% availability, suggesting a lower emphasis or application in comparison to the other indicators. Overall, the curriculum demonstrates a strong focus on fundamental mathematical concepts, with an average mean score of 2.691 and a high overall availability of 89.68%, reflecting its comprehensive and widely applied nature.

5. DISCUSSION

1. General Alignment with International Standards

The findings demonstrate substantial alignment between the developed Saudi national curriculum and international core standards for early childhood mathematics education, with an overall mean of 2.691 (89.68%). This alignment reflects contemporary global trends in early childhood mathematics instruction and is consistent with the National Council of Teachers of Mathematics (NCTM) guidelines, which emphasize establishing high-quality mathematics education standards from the earliest stages (Huinker et al., 2020). These results corroborate findings from Al-Sherbiny et al. (2018), who documented the successful integration of international mathematics standards into Saudi Arabia's early childhood curriculum.

2. Counting, Enumeration, and Integer Operations

This standard achieved the highest availability rating ($M = 2.75, 91.67\%$), indicating strong curricular

emphasis on foundational numerical competencies. These findings align with research by Nguyen et al. (2016), which underscores the critical importance of early numerical skill development as a prerequisite for subsequent mathematical achievement. The results are further consistent with Common Core Standards recommendations (Hartman et al., 2023), which prioritize number sense development in early education. This emphasis reflects the CCSS principles of focus and coherence in presenting fundamental mathematical concepts (Polikoff, 2014) and supports Atefi and Al-Meligy's (2015) assertion regarding the foundational role of mathematical concepts in early childhood learning.

3. Measurement, Data Analysis, and Geometric Concepts

These domains demonstrated equally robust availability ratings ($M = 2.75, 91.67\%$), suggesting comprehensive coverage of spatial and measurement reasoning. This curricular emphasis is supported by research demonstrating that early geometric and spatial instruction enhances overall mathematical performance and logical reasoning capabilities (Woodward et al., 2012; Hawes et al., 2015). The strong presence of these concepts aligns with CCSS emphasis on practical application and contextualized learning activities (Zimba, 2014), reflecting the pedagogical principle of connecting mathematical ideas to children's everyday experiences. This approach is validated by Abdel Moneim's (2019) findings on the effectiveness of real-world contexts in developing mathematical understanding among young learners.

4. Operations and Algebraic Thinking

This standard exhibited high availability ($M = 2.6, 86.67\%$), demonstrating the curriculum's attention to foundational algebraic reasoning. These results support the position advanced by Kaput and Blanton (2016), who advocate for introducing fundamental algebraic concepts early to establish advanced mathematical thinking skills. The findings

align with contemporary early childhood mathematics pedagogy, as articulated by Clements and Sarama (2018, 2020), which emphasizes presenting diverse, interconnected mathematical concepts to create a robust foundation for future learning.

5. Rational Numbers and Decimal Operations

This standard recorded the lowest availability rating ($M = 2.25$, 75.0%), though still within acceptable range. Despite this moderate score, research indicates that early exposure to fractions and decimals significantly enhances comprehensive mathematical understanding (Van Hoof et al., 2018; Siegler et al., 2012), suggesting potential for curriculum enhancement in this domain. This relative underemphasis may be interpreted through Piagetian developmental theory, which advocates for stage-appropriate mathematical concept introduction (Abdel Moneim, 2019). The abstract nature of decimal operations may warrant delayed emphasis until children achieve appropriate cognitive developmental milestones.

5.1. Synthesis and Implications

The relatively consistent availability across most standards suggests an integrated approach to mathematical concept instruction, reflecting the coherence principle central to CCSS (Daro et al., 2011). This integrated methodology facilitates deep, comprehensive understanding of mathematical concepts among young learners. However, the comparatively lower availability of rational number and decimal operation content indicates opportunities for future curriculum refinement. This observation aligns with broader recommendations for expanding mathematical content coverage in early childhood education to optimize long-term student outcomes.

These findings indicate that the developed national curriculum demonstrates strong alignment with contemporary international trends in early childhood mathematics education. Nevertheless, strategic enhancement opportunities exist, particularly in operations and algebraic thinking domains, as identified by Kaput and Blanton (2005)

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in their seminal work on promoting early algebraic reasoning. Future curriculum revisions should consider strengthening these areas while maintaining the robust foundation evident in other mathematical domains.

5.2. Study Recommendations:

Based on the findings of this study, the following recommendations are made to enhance the national curriculum for early childhood mathematics:

1. Strengthen Decimal and Fraction Skills: Emphasize simplified, engaging instruction using practical activities and games.
2. Integrate Geometry Across Domains: Embed geometric concepts in counting and measurement to foster holistic learning.
3. Foster Early Algebraic Thinking: Use visual patterns and symbols to develop foundational algebraic reasoning.
4. Utilize Educational Technology: Incorporate age-appropriate digital tools to enhance engagement and accessibility.
5. Ensure Ongoing Curriculum Review: Align content with current research and international standards for sustained effectiveness.

5.3. Suggested Future Studies

Based on the previous findings and proposed recommendations, the following future studies are suggested to deepen our understanding and enhance early childhood mathematics education:

1. A longitudinal study tracking children's mathematical performance after exposure to the developed curriculum
2. Experimental research comparing teaching methods for fractions and decimals in early childhood
3. Investigation of mathematics integration with other subjects
4. Comparative analysis of traditional versus technological approaches in teaching mathematical concepts
5. Evaluation of educational games' effectiveness in reinforcing mathematical concepts during early childhood.

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