

A REVIEW OF RECENTLY DEVELOPED NUMERACY ASSESSMENT, INSTRUCTION AND INTERVENTION RESOURCES FROM CANADA

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Purpose

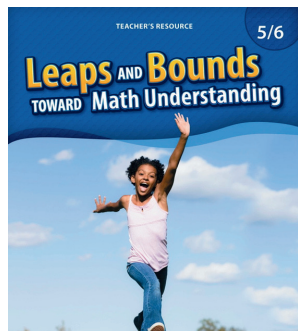
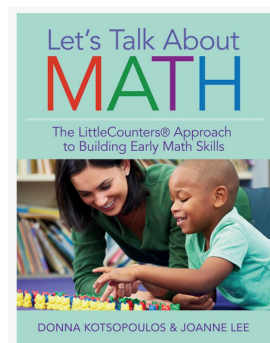
We juxtaposed 7 popular Canadian resources pertaining to developmental numeracy milestones and Canadian mathematics curricula

- Early Math Assessment,
- Leaps and Bounds,
- Jump Math,
- MeloMath4Kids,
- NyKK-5,
- Little Counters, and
- TOYBOX

Question: Do programs converge with emerging development trajectories, school curricula and intervention research?

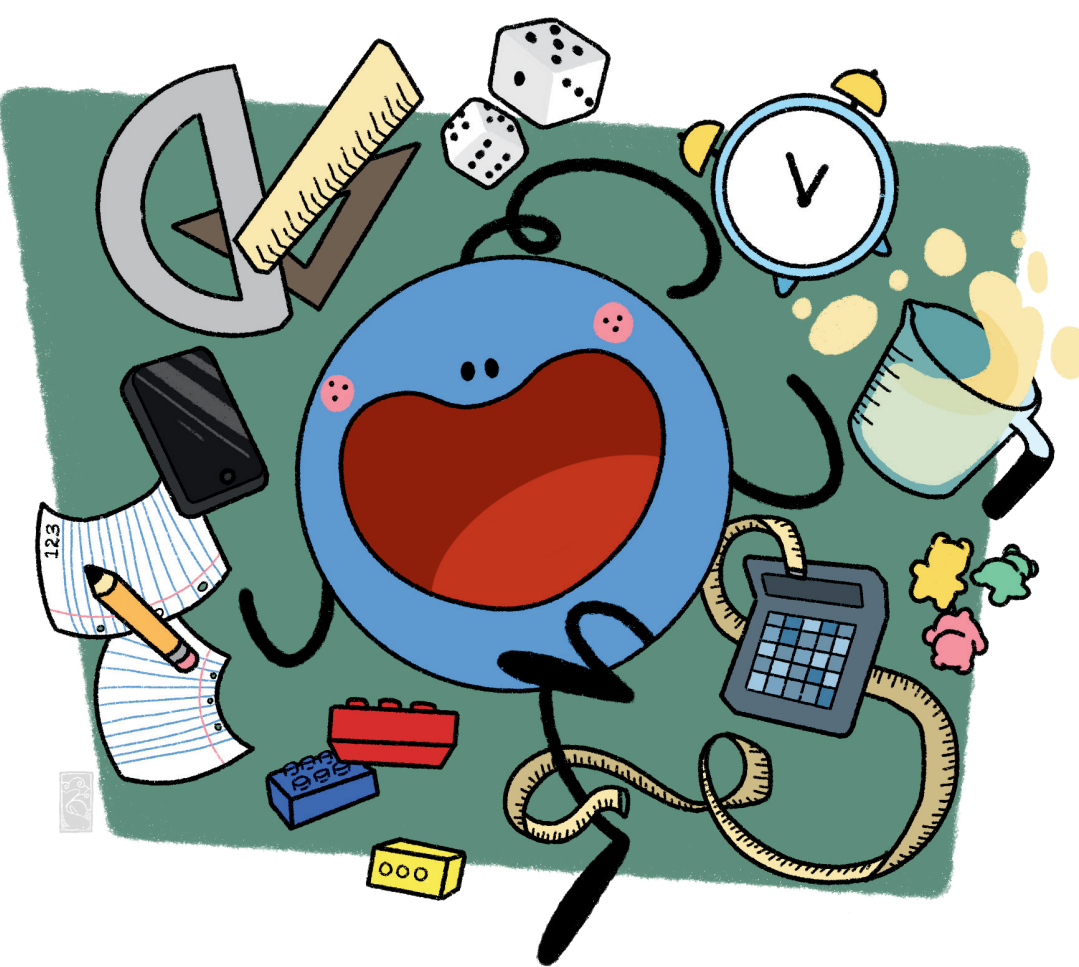
Method

- Descriptions of each program were carefully reviewed
- Program highlights at each age were identified and summarized in the table

       										
Ages/Stages	Child Development*	Manitoba Canada, Curriculum**	Early Math Assessment^	Numeracy Screener^	Leaps and Bounds^	Jump Math^	MeloMath4Kids^	NyKK-5^	Little Counters^	TOYBOX^
Birth - 2 Years	Quantity Differentiation Set Size Discrimination More/Less Recognize Shapes/Colors Subitize 1-3, Estimate 1-2 Non-verbal match small groups Say number words to 9 See Basic Patterns and Sort Use fingers to show quantity Say some number words to 30 Backward counting (1-5) Rote counting Recognize 1 digit numbers Start counting objects 1-4 Subitize/Estimate 1-5 items Stable order (1-10) Number recognition Cardinality/One-to-One (1-10) Non-symbolic Arithmetic Calendar Ordinal numbers 1-10 Saying number words 1-100 Skip count by 1s, 2s, 5s, or 10s Counting on for 1-10 Cardinality 1-20 Backward counting (1-10) Word Problems Number comparison Number naming conventions One-to-one correspondence Double digit counting Basic arithmetic Backward counting (1-20) Mental number line Recognize/identify collections Comparing/ordering 1st to 13th Arithmetic strategies (De)/Compose partners to 10 Place value (teens) Equal partition 1/2, 1/3, 1/4, 1/5	**Note: Curricula in Canada are by province. Curricula are similar across provinces, but regional differences exist. Manitoba curriculum is "behind" other provinces. Play-Based, Emergent							Birth to 5 years: One-to-one correspondence Magnitude Stable order Abstraction Symbols Cardinality Order irrelevance Parity (equivalence)	Skill Development Activities Leveled according to: - Beginner –age 2-3 yrs - Intermediate –age 4-5 yrs - Advanced ages –6-8 yrs) Shifting Shapes (N14.5) Quantity of object piles (N14.2) Hunt for same trait (N6.3) Count objects/more/less (N5.4) Name, describe shapes (N2.3) Subitizing & counting (N2.5) Create patterns (N6.4) Sort objects (N1.1) Count fingers and toes (N1.5) Backward counting (13.6) Rote counting (N2.1) One digit numbers (N8.1) Counting objects (N4.2) Stable order card deck (N5.6) Number Recognition (N11.4) Counting rows/cardinality (N3.2) Use fingers fadd/subtract (N6.6) Calendar conversations (N2.6) Puddle jump counting (N12.5) Skip counting hopscotch (N5.3) Counting on (N13.5) Card number match (N7.3) Count sets (N8.5) Count objects in box (N11.4) Count in the tens (N8.1) Basic arithmetic bowling (N7.4) Number line (N5.3) Identify collections (N6.3) Compare and order (N11.1) Math word problems (N10.5) Place value (N8.1) Create equal parts (N10.3) Identify geometry in food (N9.6) Measure using a ruler (N7.5) Patterns & movement (N2.1) Hundreds knowledge (N14.1) Count steps N3.1 Add Subtract(N9.1) Mental math w. cards (N10.6) Symmetry with mirrors (N7.6) Measurement (N7.5) Card game for 1000s (N13.4) Multiplication leap frog (N14.3) Dividing pizza (N13.3) Equivalence with a pie (N14.4) Fractions while baking (N5.2)
2 - 3 Years										
3 - 4 Years										
4 - 5 Years						(Preschool modules are available, but we did not access in time of review.)				
5 Years		5 yrs (Senior Kindergarten) Number sequence 1-30 Numeral to quantity 1-10 Show numbers 2-10 in 2 ways Name dot arrangement to 6 Backward counting 10-1 Compare quantities 1-10 Order numbers 1-10 Simple repeating patterns Compare 2 items on 1 attribute	5 years: Verbal counting Counting sets Number naming Number line Comparing numbers	5 years: Symbolic Magnitude Non-Symbolic Magnitude • 2-4 minutes to complete • Used for age 5-8 years		5 years: Counting, cardinality Comparison Geometry shapes Sort/categorize/measure Addition & Subtraction Fact Fluency Base ten numbers 11 to 20		5 years: Number naming Numbers 1-10 Teen numbers Relation among numerals, number names, and quantity Counting manipulatives forward and backward by 1, Add & Subtraction to 10	5 years: Quantity recognition Counting Number knowledge Non-verbal calculation Story problems Combinations part-whole Daily whole-class activities NyKK talks e.g., (calendar, 100s chart)	
6 Years		6 years (Grade 1): Forward/backward by 1, 2, 5, 10 Counting strategies 0-100 Estimate quantities to 20 Represent/describe #s to 20 Part-part-whole up to 30 Add/subtract to 20 Add/subtract to 18 mental math Compare and order sets Repeating pattern (2-4 items) Equality 0-20 Measure and compare Sort/Replicate/compare 2D/3D	6 years: Verbal counting Counting sets Number naming Number line Comparing numbers Addition Subtraction		6-7 years (Grade 1-2): Counting (forward, backward, skip) Whole Number (subitizing, estimating, # ID) Comparing Whole Numbers - Add/Subtract (Different types) Patterns (Identify, repeat, create) Geometry (2D & 3D) Measurement (length, area, mass, capacity) Data Management (sorting, graphs)		6 years: Counting/comparing Problem solving forms Number/operations Base 10 Greater than and less than Place value Measure length, time Represent/interpret data Reasoning with shapes	6 years: Number naming Decade numbers Teen and decade number words out of sequence Count for/back by 1,10 Add/subtract facts to 20 Skip counting by 2,3,4,5,10 Exposure and number talks w. clocks, money, measuring		
7 Years		7 years (Grade 2): Order/ordinal position Represent/Compare/order <100 Place value up to 100 Increasing patterns to 100 How +/- affects a number Add/subtract to 100 Estimate to 100 Odd/even numbers to 100 Equality/inequality Measure non-standard units #days in week/ #months in year Sort/Describe/compare 2D/3D Gather and record data Construct/interpret pictographs	7 years: Number writing Number line Comparing numbers Addition Subtraction Multiplication Equations Number order			7 years: Number sense to 20 Add/subtract to 100 Equation and word problems Using 10 to add/subtract Skip counting/estimating Add/subtract strategies Money Fractions Multiplication/division Grow/shrink/Repeat patterns Measure: length, mass, time, area, calendar, capacity, temp. Geometry: 2D/3D shapes, symmetry, Sort/graph, Probability	7 years: Number naming Hundreds level For/back counting by 1,10 Add/subtract up to 20 Add/Subtract up to 100, Skip counting by 2,3,4,5,10 Number talks with clocks, money, measurement			
8 Years		8 years (Grade 3): Skip counting by 1s-5s, 10s, 25s Estimate quantities < 1000 Increase/decrease pattern<1000 Solve +/- questions w unknown Measure using cm, m, g, kg Represent numbers up to 1000 Place value to 1000 Compare/order numbers <1000 Fractions Add/Subtract numbers <1000 Mental math up to 1000 Multiply/divide to 5x5 Time concepts Sort Regular/irregular polygons Describe 3D objects Collect data/bar graphs Perimeter regular/irreg shapes	8 years: Number writing Number line Comparing numbers Addition Subtraction Multiplication Equations Number order		8-9 years (Grade 3-4): Whole #s - to 1000, 100, 20 Skip Count to 1000, 100, 20 Comparing/Ordering Numbers Adding Whole #s -1-3-digits Subtract Whole #s - 1-3 digits Fractions (sets, wholes, halves) Mental Math regroup Algebra (grow, shrink, repeat) Patterns - grow, shrink Equality - #s to 100 and to 20 Geometry (2D and 3D shapes, grids, positional language) Measure (length, mass, capacity, area, time, diff units Data Management (sort/organize/display/graphs)	8 years: Number patterns Add table, Sums/differences Skip counting Multiplication/division Money Unknown numbers Base 10 Number/operations Place value Rounding and estimating Measure perimeter/ area/ time/ length/ volume/ mass Measure in US units Graphs Geometry 2D/3D Shapes Fractions	8 years: Number naming Thousands level Add/Subtract up to 1000, Skip counting by 2,3,4,5,10 Multiply/divide by 2,3,4,5, Number talks and problem solving with clocks, money, measurement, fractions			
9 Years										
	Development continues...									
	*Note: Very approximate list of skills and ages associated with development									
						Program continues beyond age 8 years to age 14 years	Program continues beyond age 8 years to age 14 years	Program continues beyond 8 years to age 10 years.		

*Note: Very approximate list of skills and ages associated with development

EMA@School, Numeracy Screener = Early Years Numeracy Assessment Screener
Leaps and Bounds, Jump Math, Melo Math 4 Kids, NyKK-5= Instruction/Intervention Programs
Little Counters/TOYBOX= Instruction/Intervention (Home) Activities for Caregivers and Children
Development Reference: Clements, Sarama & DiBiase (2003). Engaging young children in mathematics. NY: Routledge



Conclusion

- There is **decent overlap among programs**, developmental milestones, and school curricula
- Few programs focus on **rapid preschool skills development** before school entry
- There is heavy focus on **number sense** across all programs
- Programs designed to focus on cyclical development with children working on small numbers before large ones
- **Specialized programs** offer support in different settings and with different ages