Board Learning Session: Fact Fluency in Math

Syós:ys lets’e th’ále, lets’emó:t

~One heart, one mind, working together for a common purpose~

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Why Canadian students are falling behind in math — and what experts say needs to change

By Jordan Fleguel

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A workbook is seen on a student's desk in an elementary school classroom. (Source: THE CANADIAN PRESS/Darryl Dyck)

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Getting Math Instruction Right: Strategies for Improving Achievement in Canada

- Over the past decade, Canadian math scores on the Program of International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) declined in all provinces. Canadian fourth-grade students performed below the international average on nearly every benchmark level of math achievement on the 2023 TIMSS assessment.

- Research shows early math achievement predicts later academic achievement and futur earnings. Strong math skills are crucial for career sectors like technology, finance, and da science.

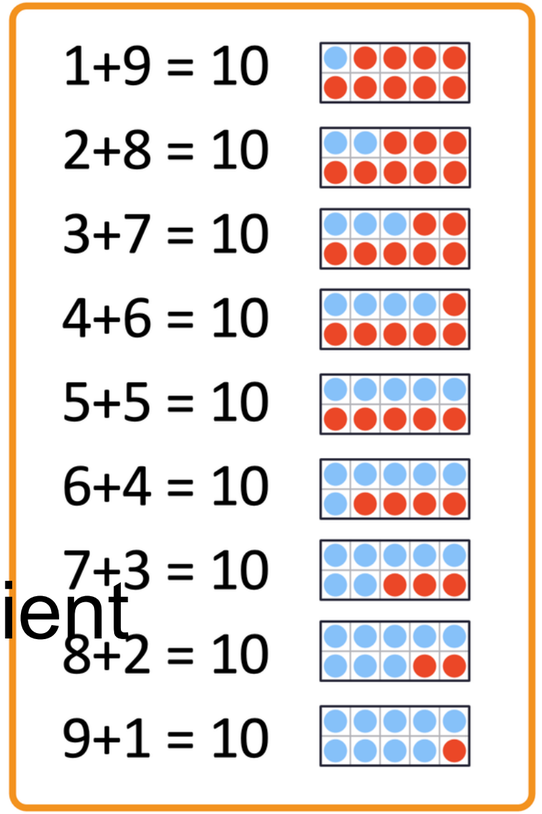
Recommendations that are actionable at the district level include:

- Support classroom instruction that focuses on the direct and explicit teaching of math strategies, procedures, and competencies.
- Implement universal screening in math for all K-8 students using screening tools with demonstrated predictive validity
- Pair screening with evidence-based interventions.
- Adopt a mandatory times tables check before the end of Grade 4.

Fact Fluency - Definition and Goal

- **Fact fluency** is the accurate, efficient, and flexible knowledge of math facts

- The goal is **automaticity** ("just knowing it" within about 3 seconds). Students can achieve automaticity by memorizing facts and internalizing appropriate, efficient strategies to solve them.



Example:

$$9+8$$

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9+8

Some students will find it easy to memorize, so drills might be effective for them. **9+8=17**

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For others, a “Making Ten” strategy will make sense. We can teach them that strategy, then allow practice through games and activitities. **9+8 is like 10+8 -1=17**

For another group, a “Near Doubles” strategy will make sense. We can teach them that strategy, then allow practice through games and activitities. **9+8 is like 8+8+1=17**

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Fact Fluency Strategy Progressions

Addition

Multiplication

K	**Counting** • one-to-one correspondence • conservation • cardinality • stable order counting • sequencing 1-10 • linking sets to numerals • subitizing	**"Add and Subtract 0, 1, and 2"** Examples: 2 more than 5, 1 less than 8, 2 less than 3, 1 more than 7	**"Combos of 10"** Examples: 10+0, 9+1, 8+2, 7+3, 6+4, 5+5, 4+6, 3+7, 2+8, 1+9, 0+10	**"Doubles to 10"** Examples: 1+1=2 2+2=4 3+3=6 4+4=8 5+5=10
Gr. 1	Review, reinforce, and allow practice time for the K strategies, plus → Extend addition fluency strategies to numbers up to 20.	**"10+___"** Examples: 10+6=16 3+10=13 9+10=19 10+1=11	**"Doubles to 20"** Examples: 6+6=12 7+7=14 8+8=16 9+9=18 10+10=20	
Gr. 2	Review, reinforce, and allow practice time for the K and 1 strategies, plus → Extend addition fluency strategies to two-digit numbers up to 100.	**"Making Ten"** Example: 7+5= 7+3+2= 10+2=12	**"Near Doubles"** Example: 7+8= 7+7+1=15	**"Skip count by 2s, 5s, and 10s"** Examples: From zero: 2, 4, 6, 8, 10, 12... From a multiple: 15, 20, 25, 30, 35... Backward: 80, 70, 60, 50, 40, 30...

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Gr. 3	Review, reinforce, and allow practice time for all strategies from previous grades until students have achieved automaticity with addition fact from 1+1=2 to 10+10=20. Extend addition fluency strategies to multi-digit numbers.	Multiplication Concepts • Understanding concepts of multiplication (e.g., groups of, arrays, repeated addition) • Connecting multiplication to skip-counting.	"Multiply by 0 and 1" Examples: 1x1=1 1x0=0 2x1=2 0x2=0 1x3=3 8x0=0 4x1=4 0x6=0		
By the end of Grade 3, most students should be able to recall addition facts to 20 (From the BC Curriculum)					
Gr. 4	Review, reinforce, and allow practice time for all addition strategies from previous grades until students have achieved automaticity with addition facts from 1+1=2 to 10+10=20. Extend addition fluency strategies to multi-digit numbers.	Review, reinforce, and allow practice time for Gr. 2 and 3 multiplication strategies, plus →	"Add/Subtract a Group" Examples: 10x5 = 50, so 9x5 = 50-5 = 45 2x4 = 8, so 3x4 = 8+4 = 12		
Students should be able to recall the following multiplication facts by the end of Grade 4 (2s, 5s, 10s). (From the BC Curriculum)					
Gr. 5	Review, reinforce, and allow practice time for all strategies from previous grades until students have achieved automaticity with addition facts from 1+1=2 to 10+10=20. Extend addition fluency strategies to multi-digit numbers.	Review, reinforce, and allow practice time for Gr. 2, 3, and 4 strategies, plus →	"Squares" Examples: 1x1=1 2x2=4 3x3=9 4x4=16	"Near Squares" Example: 8x8 = 64, so 9x8 = 64+8 = 72 7x7 = 49, so 6x7 = 49-7 = 42	"Doubling" If you can multiply by 2, then you can double to find your 4s, and double again to find your 8s. Examples: 2x6 = 12 4x6 = 24 8x6 = 48
Students should be able to recall the following multiplication facts by the end of Grade 5 (2s, 3s, 4s, 5s, 10s). (From the BC Curriculum)					

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Fact Fluency Assessments

Addition Fact Fluency Assessment Name: _____

Date: _____

A.	5 + 2 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line
B.	8 + 5 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
C.	6 + 10 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
D.	7 + 8 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
E.	9 + 5 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
F.	3 + 3 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
G.	2 + 7 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
H.	7 + 9 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
I.	8 + 8 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:

J.	10 + 4 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
K.	6 + 1 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
L.	5 + 7 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
M.	8 + 3 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
N.	9 + 9 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
O.	3 + 4 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
P.	4 + 6 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
Q.	1 + 8 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
R.	7 + 3 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:
S.	8 + 6 = ____	❑ counted on ❑ used a strategy → ❑ just knew it ☆ it's a trickster!	Counted on: ❑ in my head ❑ fingers ❑ number line Share more about the strategy you used:

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Fact Fluency Assessment Data

Codes for How Students Responded: c = counted on, s=strategy, g = got it (knew it), t = trickster, x = answered wrong

		Foundation Fact Sets											Derived Fact Strategies									
		+/- 0, 1, 2				Doubles			Combo to 10		10 + ____		Near Doubles			Making 10/ Pretend -A-10						
		A	G	K	Q	F	I	N	P	R	C	J	D	H	O	B	E	L	M	S		
	Finish Time (minutes)	5+2	2+7	6+1	1+8	3+3	8+8	9+9	4+6	7+3	6+10	10+4	7+8	7+9	3+4	8+5	9+5	5+7	8+3	8+6	Automatic?	Notes
	2	g	g	g	g	g	g	g	g	g	g	g	g	g	g	c	g	c	g	c	Yes	
	10	c	g	g	g	g	c	c	c	c	g	g	c	c	g	c	g	c	g	c		
	11	g	c	g	g	g	c	c	x	c	x	c	c	c	c	c	c		x	c		
	6	g	s	g	g	g	g	g	g	g	g	g	c	c	x	c	g	s	g	c		Using strategies, but things are still taking a long time
	4	g	g	g	g	g	c	g	c	g	g	g	c	c	s	c	g	c	x	c	Getting close	
	6	g	g	g	c	c	g	g	g	g	g	g	s	c	g	s	g	c	g	c	Getting close	
	10	g	g	g	g	g	g	x	c	c	c	g	c	g	g	c	c	c	c	c		
	1	g	g	g	g	g	g	g	c	g	g	g	g	g	g	g	g	g	g	g	Yes	
	5	g	g	g	g	g	g	x	g	g	g	g	g	g	g	c	g	c	g	g		Took a long time for so many "just knew it"
	5	c	g	g	g	g	g	g	g	g	g	g	g	c	g	c	g	g	g	g	Getting close	
	4	c	g	g	g	g	c	c	c	g	c	c	c	c	g	c	c	c	c	c	Getting close	Must be a fast counter!
	1	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	Yes	
	4	c	c	g	g	g	g	g	c	g	g	g	s	g	s	s	s	c	c	c	Getting close	Using strategies well
	5	x	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g		Took too long for all "just knew it"
	4	c	c	g	g	s	t	g	c	c	g	g	s	s	c	c	c	c	c	c	Getting close	
	5	g	g	g	g	g	c	g	g	g	g	g	c	g	g	c	g	c	g	g		
	2	g	g	g	g	g	g	g	g	g	g	g	g	g	g	t	g	c	g	g	Yes	Good strategy use and fast counting
	?	g	g	g	g	g	g	c	g	g	g	g	s	g	g	s	g	c	g	c	Yes?	She didn't let me know when she finished, so I can't be sure. Strategy use and "just knew it" looks good though.
	4	g	g	g	g	g	g	g	g	t	g	g	g	t	t	t	g	t	g	g	Yes?	Lots of "tricksters." May be getting the answers correctly and quickly, but not trusting herself.
	1	g	g	g	g	g	g	g	g	g	g	g	c	g	g	g	g	x	g	g	Yes	One error, but strong otherwise. She might benefit from slowing down and checking.
	1	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	Yes	
	5	g	g	g	g	g	g	g	g	g	g	g	c	g	g	c	g	g	g	c	Getting close	
	1	g	g	g	g	g	g	g	g	g	g	g	c	g	g	c	g	g	g	c	Yes	
	5	g	g	g	g	s	g	g	c	g	c	g	c	c	g	c	g	c	c	s		
	6	c	s	g	g	g	c	s	c	g	g	g	c	s	c	c	g	c	g	c		
	5	g	g	g	g	g	g	c	g	c	g	g	g	c	g	c	c	c	c	g		

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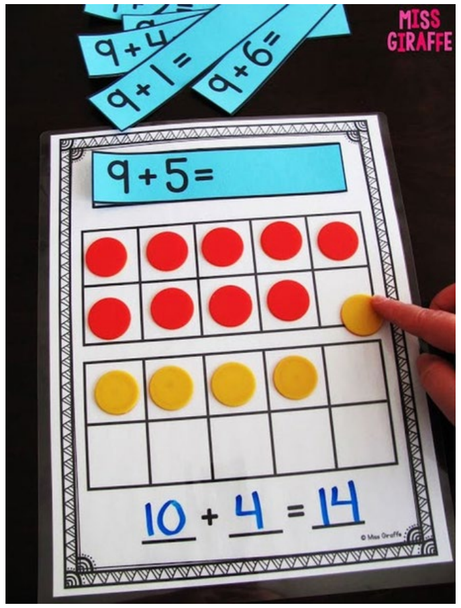

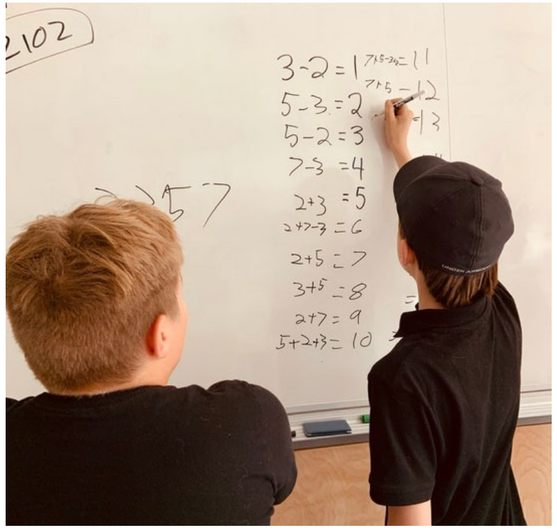

Where we are:

- *with fact fluency*
- *with the rollout*

Where we're going:

- *resource enhancement*
- *EdPlan integration*
- *continue with optional?*
- *Ministry is looking for a screener*


why
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QUESTIONS
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