



January 13, 2026

EDUCATION, SKILLS AND LABOUR MARKET POLICY

Getting Math Instruction Right: Strategies for Improving Achievement in Canada

by Anna Stokke

- Over the past decade, Canadian math scores on the Program of International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) have 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 future earnings. Strong math skills are crucial for career sectors like technology, finance, and data science.
- Canada's declining math performance is an urgent national concern requiring immediate action by provincial governments.
- This E-Brief outlines five recommendations to reverse Canada's declining math scores: align math instruction with the science of learning; use assessments and data to drive improvement; strengthen provincial math curricula; improve teachers' math knowledge; and appoint implementers committed to reform goals.

Introduction

Strong math skills are essential for careers that drive Canada's economy, including technology, artificial intelligence, finance, and data science. To remain globally competitive and address long-term income gaps, improving math achievement among Canadian students must be a national priority.

The author thanks Colin Busby, Brian Poncy, Narad Rampersad, John Richards, Andrew Sharpe, Benjamin Solomon, Ross Stokke, Rosalie Wyonch, and Tingting Zhang for comments on an earlier draft. The author also thanks John Mighton and Nuno Crato for discussions and advice. The author retains responsibility for any errors and the views expressed.



The link between early math skills and later academic success is well established (Duncan et al. 2011; Siegler et al. 2012). Early math achievement also correlates positively with future career earnings. According to Werner et al. (2024), math achievement in childhood is a better predictor of adult earnings at age 30 than reading, health, or social-emotional skills. These effects were observed across all demographic groups.

Canada ranked in the top 10 in math on the 2022 PISA survey, an international OECD assessment of 15-year-olds. However, ranking near the top of a falling curve does not imply that all is well. Math achievement has been falling for well over a decade, beginning well before the COVID-19 pandemic. More Canadian students now struggle in math, fewer excel, and in several provinces, the decline is roughly equivalent to two or more years of schooling.

The OECD estimates that a 20-point drop on PISA roughly equates to about one year of learning (OECD 2023). Math scores in all provinces declined more than 20 points since 2003. Seven provinces experienced declines of over 40 points,¹ representing approximately two years of lost learning, while the 58-point drop in Manitoba and Newfoundland and Labrador is close to three years.

In all provinces, the share of students below Level 2 on PISA increased since 2003, more than doubling in every province except Prince Edward Island and Quebec. Level 2 reflects the baseline level of mathematics proficiency to participate fully in society. Over the same period, the proportion of top performers declined in every province (OECD 2023; Richards 2025). In four provinces, at least 30 percent of students scored below Level 2 on the 2022 PISA test.²

The latest results from TIMSS³ have flown under the radar in Canada, but they should be another wake-up call. PISA and TIMSS assess different constructs. PISA focuses on mathematical literacy while TIMSS tests Grade 4 and Grade 8 students on curriculum-based academic skills (e.g., arithmetic, fractions, pre-algebra), which are essential for later math courses.

Students from Alberta, Manitoba, Newfoundland and Labrador, Ontario, and Quebec wrote the 2023 Grade 4 TIMSS assessment. While not all provinces participated, these jurisdictions educate well over half of Canada's students. Results showed a clear downward trend since 2015, predating the COVID-19 pandemic: Canadian Grade 4 students scored below their peers in the United States, well below those in England, and significantly below top-performing countries like Singapore (Figure 1).

Even more alarming, Canadian fourth graders fell below the international median at nearly every benchmark level of math achievement (Table 1).

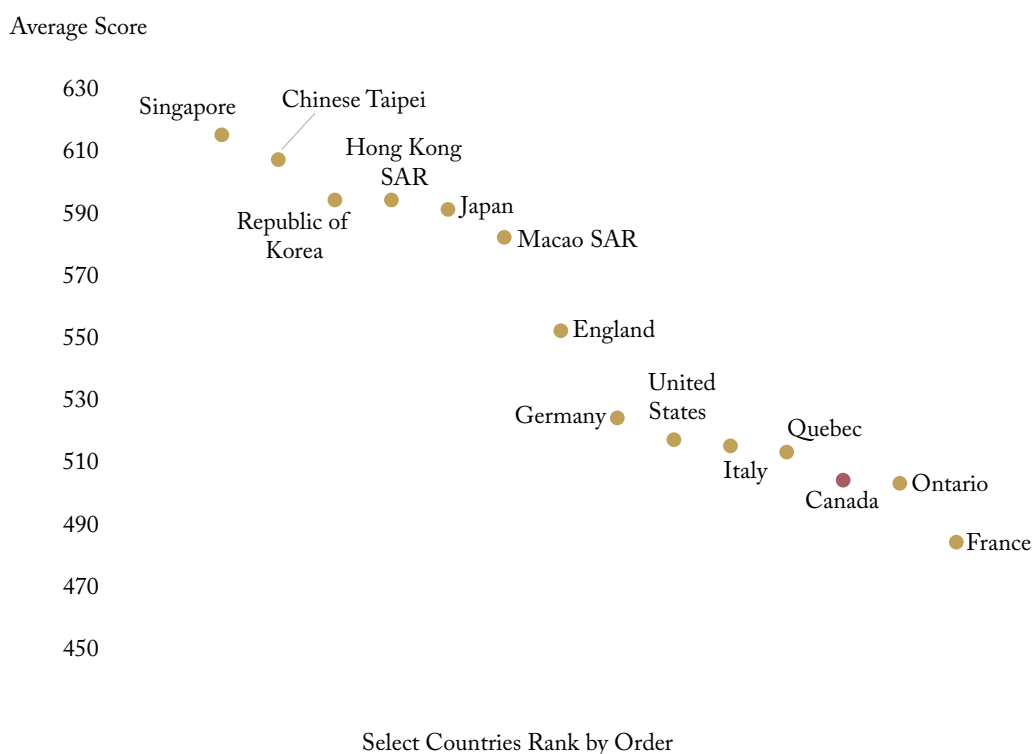
Provincial assessments tell a similar story. Ontario's most recent EQAO tests show that 36 percent of Grade 3 students, 49 percent of Grade 6 students, and 42 percent of Grade 9 students are not meeting provincial standards in 2024-2025. Scores have remained stagnant over the last three years, despite provincial efforts to improve math performance (EQAO 2025).

1 Manitoba and Newfoundland and Labrador each declined by 58 points since 2003; Saskatchewan, 48; Alberta and Nova Scotia, 45; New Brunswick, 43; British Columbia, 42; Ontario, 35; and Prince Edward Island and Quebec, 22 points each.

2 In Saskatchewan, 30 percent performed below Level 2; 34 percent in Newfoundland and Labrador; and 31 percent in each of Nova Scotia and New Brunswick. Other provinces ranged from 17 percent (Quebec) to 29 percent (Manitoba).

3 At the fourth grade, 58 countries participated in TIMSS 2023. The scores of most countries fall within the range of 400 to 600 points. The fourth-grade TIMSS mathematics assessment addressed three content domains: number, together with introductory algebraic concepts (50 percent), measurement and geometry (30 percent), and data (20 percent) (von Davier et al. 2024).

Figure 1: Average Mathematics Achievement, Selected Countries



Note: See Appendix A for a complete list of countries that participated in the 2023 TIMSS survey and their average mathematics achievement.

Source: 2023 TIMSS survey.

Canada invests heavily in education, spending more per student than the OECD average (Figure 2), but higher education spending does not necessarily translate into better outcomes. Evidence suggests that cumulative expenditure per student between ages six and 15 improves PISA performance up to approximately US\$100,000, after which additional investment yields minimal measurable gains in student achievement (OECD 2024). For example, the cumulative spending per student between ages 6 and 15 in Canada is US\$125,260, yet Canadian 15-year-olds are outperformed by their Japanese counterparts, even though Japan spends approximately 14 percent less per student (OECD 2024). This suggests that increased funding alone cannot resolve educational performance gaps.

High-performing systems tend to strategically allocate resources toward evidence-based interventions, such as teacher quality improvements, rigorous curriculum design, standardized assessments, and targeted student support. For countries already spending above the threshold, including Canada, improving educational outcomes may require refocusing resources rather than increasing spending.

Evidence-based instructional strategies need to drive education investment decisions. This E-Brief outlines actionable policy recommendations to reverse the downward trend in Canada's math performance and maximize returns on existing educational expenditure.

Table 1: Proportion of Students Meeting International Benchmarks, Selected Countries

Country	Advanced Benchmark (625)	High Benchmark (550)	Intermediate Benchmark (475)	Low Benchmark (400)
	(percent)			
International Median	7	35	70	91
Singapore	49	79	93	98
Chinese Taipei	40	81	97	100
Hong Kong SAR	38	74	91	98
Republic of Korea	36	75	93	99
Japan	32	73	95	99
England	22	53	80	94
United States	13	39	68	87
Germany	8	38	75	94
Italy	7	34	69	91
Canada	6	29	65	90
Ontario*	6	29	64	89
Quebec*	6	33	71	94
France	3	20	56	85

Notes: Percentages are cumulative; for example, students meeting the Advanced Benchmark are also included in High, Intermediate, and Low categories. Appendix B provides a complete list of participating countries and their 2023 TIMSS results.

* Ontario and Quebec participated as TIMSS benchmarking participants, allowing for direct comparison of their students' performance with other education systems internationally.

Source: 2023 TIMSS survey.

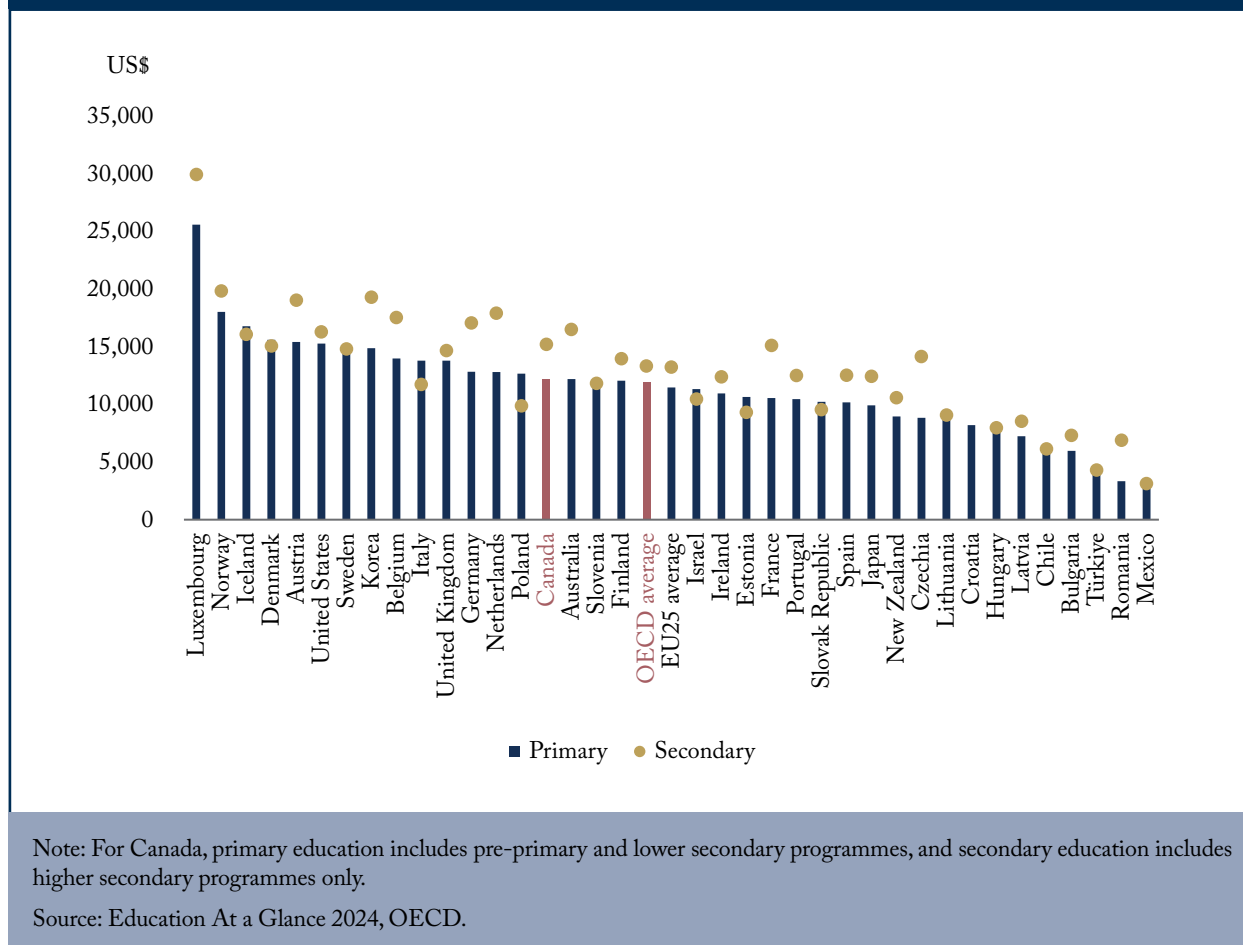
Align Math Instruction with the Science of Learning⁴

Math Instruction Must be Grounded in High-quality Evidence

A major barrier to improving math outcomes in Canada is that many school math programs are not grounded in scientific evidence about how best to teach and learn math. Many popular math programs emphasize

⁴ The Science of Learning refers to the scientific study of how people learn, often incorporating studies from cognitive science research (Mayer 2017; Deans for Impact 2015). In this E-Brief, the term also includes scientifically informed, evidence-based practices for teaching mathematics; that is, practices supported by empirical evidence from controlled studies (Coddington et al. 2023).

Figure 2: Total Expenditure per Full-time Equivalent Student in Primary and Secondary Education (2021)



approaches such as inquiry-based or discovery-based learning,⁵ collaborative problem solving, or open-ended tasks.⁶ But a large body of research shows that problem-solving ability develops most effectively through explicit teacher-led instruction, which incorporates clear explanations, worked examples, purposeful practice, and feedback (Archer et al. 2011; Fuchs et al. 2021; Hughes et al. 2017; Stockard 2018; Sweller et al. 2010; Kirschner et al. 2006; Hartman et al. 2023; Guilmois et al. 2025).

- 5 Inquiry-based or discovery-based learning emphasizes student exploration of mathematical problems with minimal direct instruction from the teacher. In these settings, students often work in groups to attempt problems before formal explanations or worked examples are provided (see Stokke 2015 or Kirschner et al. 2006 for a more detailed discussion).
- 6 Open-ended tasks are problems with multiple solutions or interpretations. For example: “If the perimeter of a shape is 30 cm, what could the shape be?” These can be interesting challenges for students who have mastered core math content, but they may not effectively target the foundational skills that novice learners need exposure to. Currently, there is limited evidence that using open-ended tasks improves math achievement.

As Andreas Schleicher, Director for Education and Skills at the OECD, has noted, PISA results reveal that teacher-directed instruction is a stronger predictor of achievement than student-oriented learning (Schleicher 2019). Recent analyses of PISA data from a sample of European countries found that student-oriented (or inquiry-based) instruction was negatively associated with PISA math achievement (Liu et al. 2024). Similar correlations have been observed in the 2010 Pan-Canadian Assessment Program (PCAP) data; the use of teacher-directed instruction was associated with better math performance, while indirect instruction was strongly associated with lower scores (CMEC 2012).

Explicit instruction benefits diverse groups of learners and is particularly critical for novice learners. Powell et al. (2025) describe systematic, explicit instruction as “the instructional approach that has amassed the strongest research base in mathematics, particularly when supporting students with mathematics disabilities or difficulties.” Hughes et al. (2017) identified five essential components of explicit instruction, based on the research literature:

1. Model: Teacher demonstrates key concepts clearly and concisely.
2. Break down concepts: Teach complex skills in manageable steps.
3. Fade support: Gradually reduce instructional guidance as students gain independence.
4. Respond and feedback: Provide frequent opportunities for student responses and feedback.
5. Practice: Create purposeful practice opportunities to build mastery.

Teacher professional development in math rarely focuses on explicit instruction. Some popular Canadian math programs even actively discourage teacher-led demonstrations, disparaging explicit instruction as “mimicking” (Boryga 2024). This disconnect between evidence and classroom practices undermines student success.

Governments Must Set Evidence Standards

Most math programs and instructional approaches are marketed as “research-based,” but the term carries no specific criteria for what qualifies as credible evidence. In science, that phrase usually means rigorous, replicated evidence. In education, it can mean a survey, a case study, or an opinion dressed up as evidence. Without clear standards for what constitutes evidence, schools will continue to adopt programs unsupported by rigorous studies.

The What Works Clearinghouse practice guides published by the Institute of Educational Sciences (IES) identify, evaluate, and rate recommended instructional approaches (e.g., Fuchs et al. 2021; Gersten et al. 2009). High-quality research on effective math instruction has also been summarized by the National Math Advisory Panel (NMAP 2008) and Barak Rosenshine (Rosenhine 2012).

Provincial governments should set evidence standards, drawing on evidence syntheses such as the NMAP Final Report and IES practice guides, prioritizing randomized controlled trials and peer-reviewed studies that show measurable improvements in math achievement. Funding should be directed toward evidence-based programs.

Engage Science of Learning Experts in Math Reform

Cognitive scientists, behavioural scientists, and educational psychologists have warned about the limited use of evidence-based math instruction and persistence of pseudoscientific practices in math classrooms (e.g., Codding et al. 2023; Hartman et al. 2023). These experts offer underused insights about how students develop mathematical knowledge and skills. Provincial governments should actively engage them in setting evidence standards and ensuring that instructional programs align with the best available research on how children learn math.

Math Reform Lags Behind Reading Reform

Recent Right to Read Inquiry reports in Ontario, Saskatchewan, and Manitoba (Ontario Human Rights Commission 2022; Saskatchewan Human Rights Commission 2023; Manitoba Human Rights Commission 2025) found that existing practices ignored the abundance of research on how to best teach reading, known as the “science of reading.” In response, some Canadian provinces and school districts have begun to correct decades of damage done in reading instruction by aligning policies with this evidence (Timmons 2024; CBC Radio 2024; Macintosh 2025). Math has not received the same level of attention or urgency. Despite a strong body of rigorous research, there is limited awareness among educators about how students learn math most effectively. Unlike literacy, where students may gain incidental exposure at home (e.g., by parents reading aloud), many Canadian students are only exposed to meaningful math learning in classrooms, making evidence-aligned instruction even more critical.

Actionable recommendations

- Set clear evidence standards for math programs, prioritizing randomized controlled trials and peer-reviewed studies that demonstrate measurable gains in math achievement.
- Prioritize funding for math programs and professional development aligned with high-quality evidence.
- Engage science of learning experts, such as those in cognitive science, behavioural science, and educational psychology, alongside experienced educators with a track record of effective math instruction, to guide evidence-based practices for teaching math.

Use Assessments and Data to Drive Improvement

Canada lacks clear, consistent measures of student progress in math. Without reliable data, schools cannot accurately diagnose problems early, intervene effectively, or determine whether students are on track in math. Provincial governments should prioritize two types of assessments: standardized tests and universal screening.

Provincial Standardized Testing

Standardized tests are typically given at the end of a term or school year to measure student achievement, monitor system performance, and ensure transparency.

Test scores from school-aged students are a good predictor of later academic outcomes, including post-secondary readiness and future earnings (DeChane et al. 2024). Access to reliable data allows education systems to focus on closing proficiency gaps early, thereby narrowing educational disparities later. Bergbauer et al. (2018) analyzed PISA microdata from over two million students across 59 countries, spanning six testing cycles from 2000 to 2015, and found that accountability systems using standardized tests to compare results across schools and students are associated with higher student achievement. In countries like Estonia and Portugal, standardized assessments have led to rising PISA outcomes and greater equity. In contrast, systems with limited standardized testing, such as Spain in the 1990s, struggled to identify and support struggling students, leading to greater inequality (Crato 2021).

Standardized tests provide critical information for teachers, parents, policymakers, and the public. They give parents a clear picture of their child’s academic progress so they can advocate effectively. They provide policymakers with reliable data to evaluate system effectiveness and target resources. It is standard practice in

many countries to conduct annual standardized assessments, with aggregate results published by school districts, enabling transparency and accountability to the public, but it is uncommon in Canada.

Current testing is too infrequent, which hinders early intervention and accountability.⁷ Moreover, provincial assessments may lack diagnostic value. For example, Ontario's EQAO assessments allow calculators, even for Grade 3 students, making it impossible to determine whether students have mastered basic arithmetic or learned math facts to automaticity.

Math Fact Fluency Matters

Basic arithmetic fluency is the foundation for later math success, yet many provincial assessments do not adequately determine whether students have mastered foundational skills. England addressed this by introducing mandatory multiplication tables checks for nine-year-old (Year Four) students, sending a clear signal that math fact fluency matters, and prompting schools to prioritize automaticity with math facts (Gibb 2025; Gibb and Peal 2025; UK Department for Education 2025).

The ability to recall math facts, like times tables, accurately and effortlessly from memory, is known as math fact fluency⁸ or automaticity. This is crucial since it reduces cognitive load, making it easier to tackle complex math problems that involve math facts (National Math Advisory Panel 2008; Hartman et al. 2023; McNeil et al. 2025). For example, when adding two fractions with denominators 6 and 8, math fact automaticity allows students to quickly produce 24 as the least common denominator. Students without math fact automaticity will struggle with fraction arithmetic.

Evidence-based methods for developing math fact fluency have been documented (for example, see Coddington et al. 2011; Poncy et al. 2007, 2010 and 2015; and Stokke 2024 for an overview), but if reliable data is not being collected, schools may not devote sufficient resources to this critical skill or may fail to identify students who need support. A mandatory times tables check in primary school is a straightforward, high-impact policy.

Universal screening identifies students at risk of falling behind

While standardized tests provide system-level data, universal screeners are brief, timed assessments given two to three times per year. They are designed to quickly identify students who are behind so that evidence-based interventions can be used to provide remediation to ensure more equitable access to the core curriculum.

Provincial Human Rights Commission reports highlight the importance of universal screening for reading (Ontario Human Rights Commission 2022; Saskatchewan Human Rights Commission 2023; Manitoba Human Rights Commission 2025). Math requires the same urgency. Early studies found that when this kind of data is paired with effective math interventions, student math achievement improved (Fuchs et al., 1989; Fuchs et al., 1991; Allinder et al., 2000; Nelson et al. 2023). The IES practice guide on Response to Intervention recommends

7 For example, Ontario administers EQAO tests in Grades 3, 6, and 9. Alberta administers provincial tests in Grades 6 and 9 and a diploma exam in Grade 12. Manitoba administers only one standardized test in Grade 12.

8 Fluency (or automaticity) is defined to be a combination of accuracy plus speed – being able to perform an operation accurately and without hesitation (Binder 1996). For example, when asked 6×7 , a student should respond 42 immediately, without resorting to time-consuming strategies.

screening K-8 students in math twice per year using measures that are efficient (less than 20 minutes), reliable, and demonstrate predictive validity (Gersten et al. 2009). Using valid screeners is essential to accurately identify students at risk (VanDerHeyden et al. 2021; VanDerHeyden and Solomon 2023).

Screening alone is insufficient. Screening must be paired with intervention programs that incorporate evidence-based strategies, since ad hoc or “design your own” programs are unlikely to turn things around for struggling students.

Addressing Myths About Timed Activities

Concerns that timed assessments cause math anxiety are not supported by research. In fact, struggling with math has been identified as a factor in the development of math anxiety (Maki et al. 2024). Therefore, the best way to reduce math anxiety is to improve student achievement in math. Timed activities, such as low-stakes timed practice and timed retrieval practice, are essential for developing fluency. Timed activities are a key recommendation in the IES practice guide on evidence-based supports for struggling students, and there is strong evidence that they increase math achievement (Fuchs et al. 2021). Many timed activities and assessments are brief, and students tend to enjoy them.

Timed activities such as standardized tests and screening are essential to ensure students get the support they need. Standardized tests allow students to show what they have learned, and universal screeners are like academic “check-ups,” helping to catch problems early.

Actionable recommendations

- Adopt a mandatory times tables check before the end of Grade 4.
- Prohibit calculators on primary school provincial assessments.
- Implement universal screening in math for all K-8 students using screening tools with demonstrated predictive validity.
- Pair screening with evidence-based interventions.
- Strengthen provincial standardized testing, implementing tests at key grades and tracking student progress over time.

Strengthen Provincial Math Curricula

Delays in Foundational Content are Holding Students Back

In a 2015 C.D. Howe Institute *Commentary* (Stokke 2015), I recommended that K-8 math curricula focus on concepts critical for later success in algebra and beyond. Most Canadian math curricula still delay foundational skills, leaving students behind their peers in other countries. When students build strong fluency early, they are better equipped to participate in advanced problem solving and mathematical reasoning.

Some provinces have made changes since 2015. Alberta’s 2023 revisions of the K-6 curriculum reinstated core concepts at appropriate grade levels. Ontario’s 2020 curriculum update requires recall of multiplication facts up to 12 x 12 by Grade 5. This is later than international benchmarks, and it is unclear whether fluency will improve since EQAO tests permit calculators. Manitoba and Saskatchewan also delay recall of multiplication facts (up to 10 x 10) until the end of Grade 5 and provide no accountability measures to ensure mastery. British Columbia’s 2016 curriculum is even worse, delaying or omitting key concepts entirely, and explicitly stating in the Grade

Table 2: Benchmarks for Foundational Math Skills

Fluency with addition and subtraction facts	By the end of Grade 2
Fluency with multiplication and division facts	By the end of Grade 3
Fluency with multi-digit addition and subtraction	By the end of Grade 3
Fluency with multi-digit multiplication and division	By the end of Grade 5
Be able to represent fractions and decimals, and compare them on a number line	By the end of Grade 4
Fluency with the addition and subtraction of fractions and decimals	By the end of Grade 5
Fluency with multiplication and division of fractions and decimals	By the end of Grade 6
Fluency with addition, subtraction, multiplication, and division of positive and negative integers	By the end of Grade 6
Fluency with addition, subtraction, multiplication, and division of positive and negative fractions	By the end of Grade 7
Source: NMAP (2008), table 2, except for the first two rows, which are based on common benchmarks in other countries.	

5 curriculum that “memorization of [math] facts is not intended” (Province of British Columbia, Ministry of Education, 2016). In contrast, the US Common Core and other international curricula expect students to achieve multiplication fact fluency by the end of Grade 3.

Fraction arithmetic is a strong predictor of later math achievement (Siegler et al. 2012), but is not taught in most Canadian provinces until Grades 7 or 8. This is two to three years behind the US Common Core State Standards, where students learn fraction arithmetic in Grades 4 and 5 (National Governors Association Center for Best Practices & Council of Chief State School Officers 2023). The NMAP stressed improving fraction fluency to improve algebra outcomes (NMAP 2008).

Delays in teaching foundational topics widen inequities by disproportionately harming disadvantaged students, whose families are less able to pay for private tutoring to compensate for gaps. Delays reduce practice time, leading to compounding knowledge gaps and lower success in advanced math.

The above table, based on recommendations from the NMAP final report and benchmarks from high-performing jurisdictions, serves as a guide for when key topics should be covered.

Actionable recommendations

- Revise provincial math curricula to emphasize foundational topics at earlier grades, using the above table as a guideline.
- Require automatic recall of basic math facts as an explicit learning outcome in provincial curricula where it is not currently mandated.

Curriculum changes alone are not enough. Without evidence-based math programs and accountability measures such as mandatory times tables checks, rigorous standardized assessments, and restrictions on calculator use in early grades, even strong curriculum outcomes will have limited impact on improving student achievement.

Strengthen Teacher Content Knowledge in Mathematics

To improve math outcomes for students, we must ensure they are taught by teachers with strong math knowledge. The most practical time to build this knowledge is during university, when teacher candidates complete coursework to prepare for their careers. We have a responsibility to future generations to make this investment now, before teachers enter the profession and impact students.

Math Teachers Need More than High School Math

A high school math background and pedagogy courses are not sufficient preparation for teaching K-8 math. Teachers need deep mathematical knowledge, extending beyond the content they are expected to teach, in order to anticipate misconceptions and prepare students for future math success (Ma 1999; Hill et al. 2005).

Since provincial governments certify teachers, they have a duty to ensure that teacher preparation meets minimum standards. Claims suggesting that teachers' math knowledge is unimportant or negatively related to teaching effectiveness have been debunked (Barr et al. 2024).

Most Canadian provinces follow a generalist model in K-8, where teachers instruct all subjects, including math. In my 2015 *Commentary*, I recommended that provinces require K-8 teacher candidates to complete at least six credit hours in math content courses designed to give them a solid understanding of the math they will teach. I also recommended implementing math teacher licensure exams for K-8 teachers to ensure minimum proficiency, a recommendation recently echoed by the National Council on Teacher Quality (NCTQ) (Drake et al. 2025).

The NCTQ recommends that teacher candidates receive at least 105 instructional hours in math content and 45 hours of math pedagogy,⁹ which is equivalent to three to four university-level math content courses in Canada. Apart from Quebec, no Canadian province meets this expectation, and some are regressing.

Manitoba briefly required two math content courses for students entering teacher preparation programs after 2015, with the first affected cohort graduating in 2020, but eliminated the requirement in 2024 (Macintosh 2025). While intended to boost enrolment in teacher education programs, this decision comes at the expense of students taught by unprepared teachers.

The NCTQ also recommends that elementary teacher candidates pass a strong math licensure exam, covering four core math topics.¹⁰ Ontario has recently introduced a Mathematics Proficiency Test for teacher certification, effective February 2025 (EQAO, n.d.). Other provinces have yet to follow suit.

Actionable recommendations

- Require a minimum of six credit hours in math content courses tailored to K-8 teachers, as part of licensing requirements.
- Implement rigorous math licensure exams for K-8 teachers prior to certification.

9 The NCTQ also provides recommendations on instructional hour targets for each essential math topic in math content courses, including numbers and operations (45 hours), algebraic thinking (20 hours), geometry and measurement (25 hours), and data analysis and probability (15 hours).

10 The NCTQ recommends that the four core math content topics included in math content courses (numbers and operations, algebraic thinking, geometry and measurement, data analysis and probability) make up the topics to be covered on licensure exams.

Appoint Implementers Committed to the Reform Goals

Reform in math education cannot succeed when implementation is entrusted to individuals who oppose or misunderstand its goals. Policymakers in Canada may recognize the problems within the current system and propose promising solutions to improve math achievement. However, too often, reforms fail when implementation is led by individuals invested in maintaining the very system that needs fixing. For example, despite the Ontario government's commitment to improving student achievement, improvement has been inadequate, prompting a newly announced external review (Ontario Ministry of Education 2025). To achieve meaningful and lasting improvements in math outcomes, leaders must stay engaged at every stage of the reform process. This includes carefully selecting implementers who are genuinely committed to the goals of reform, building coalitions of educators and stakeholders who support evidence-based practices, and establishing clear accountability measures to track progress and address resistance.

Conclusion

Improving math achievement in Canada requires both immediate action and long-term investments. Policymakers can implement high-impact, low-cost reforms immediately, such as introducing a mandatory times tables check and implementing universal math screening. At the same time, they can work to ensure math instruction aligns with evidence, improve provincial math curricula, and strengthen teacher certification standards.

Below is a summary of actionable recommendations for provincial policymakers and education leaders:

Use assessments and data to drive improvement

- Adopt a mandatory times tables check by the end of Grade 4.
- Prohibit calculators on primary school provincial assessments to ensure arithmetic fluency.
- Implement universal screening in math for all K-8 students, paired with evidence-based interventions.
- Strengthen provincial standardized testing by adding assessments at key grades and tracking student progress over time.

Align math instruction with the science of learning

- Set clear evidence standards for math instructional programs, prioritizing randomized controlled trials and peer-reviewed studies showing measurable gains in math achievement.
- Prioritize funding for math programs and professional development aligned with high-quality evidence.
- Engage science of learning experts, such as those in cognitive science, behavioural science, educational psychology, as well as experienced educators with a track record of effective math instruction to guide evidence-based practices for teaching math.

Strengthen provincial math curricula

- Revise math curricula to introduce foundational topics earlier, following benchmarks from the National Math Advisory Panel.
- Require automatic recall of basic math facts as an explicit learning outcome in all provincial curricula.

Strengthen teacher content knowledge in math

- Require a minimum of 6 credit hours in math content courses tailored to K-8 teachers, as part of licensing requirements.
- Implement rigorous math licensure exams for K-8 teachers before certification.

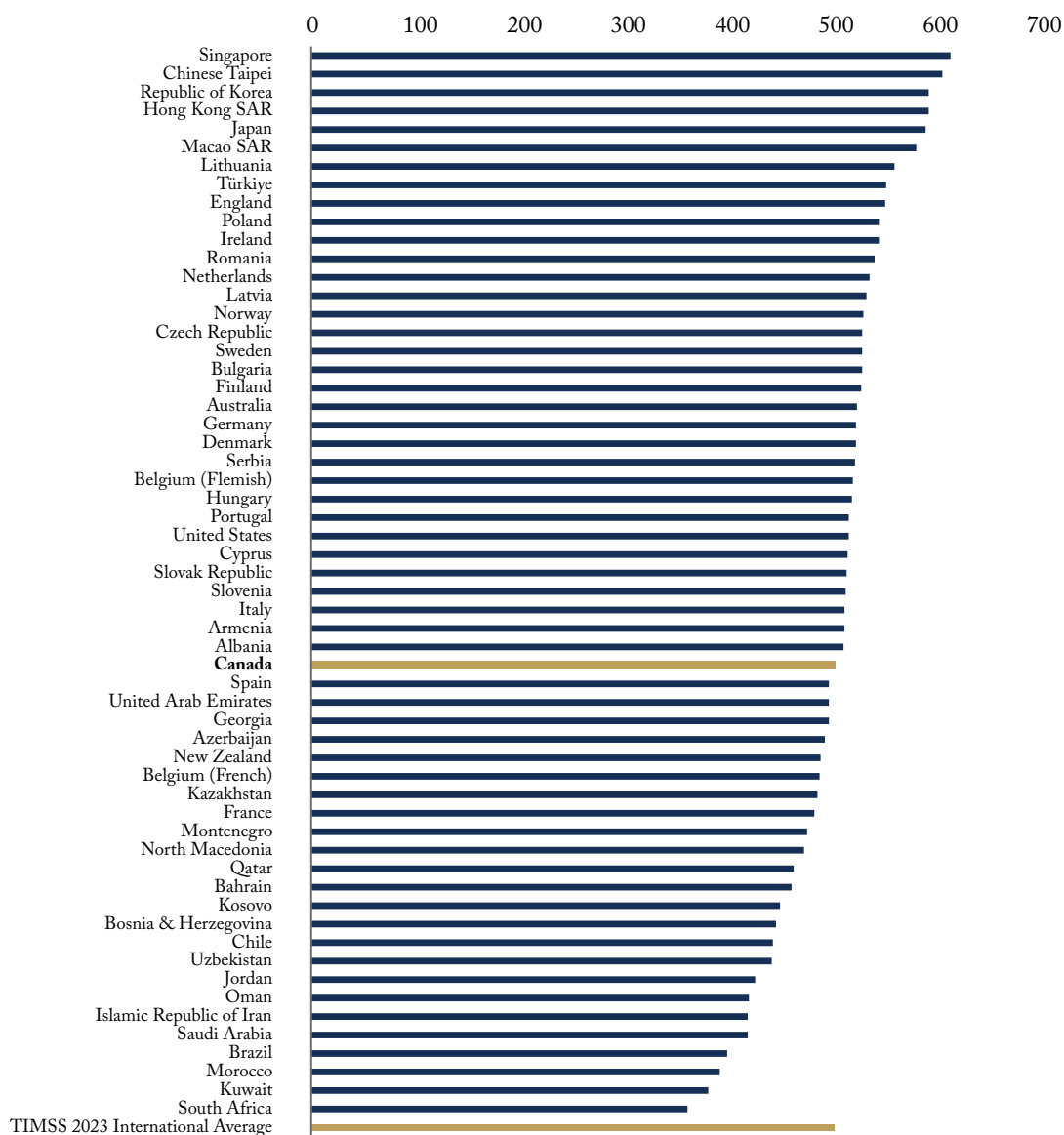
Appoint implementers committed to the reform goals

- Appoint committed implementers who support evidence-based practices to ensure policies are carried out as intended.

Better math education is crucial for Canada's students, workforce, and economic future. The time to fix math instruction in Canada is now. With committed leadership, evidence-based policies, and meaningful action, provinces can reverse the decline and set students up for long-term success in mathematics.

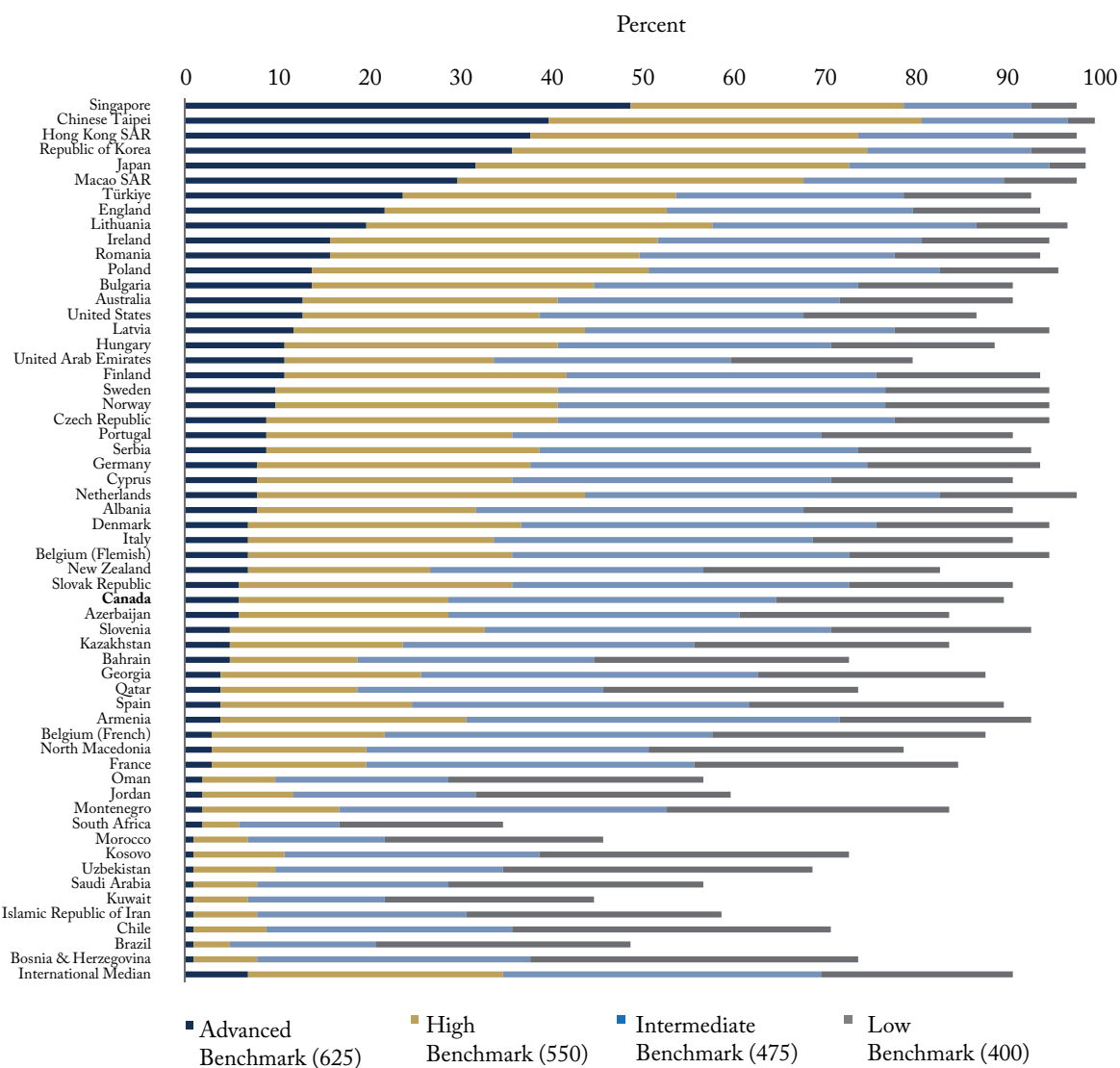
Appendix

Appendix A: Average Mathematics Achievement, TIMSS 2023



Source: 2023 TIMSS survey.

Appendix B: Percentages of Students Reaching the TIMSS International Benchmarks of Mathematics Achievement



Source: 2023 TIMSS survey.

References

- Archer, Anita, and Charles A. Hughes. 2011. *Explicit Instruction: Effective and Efficient Teaching*. New York: Guilford Publications.
- Barr, Darja, Jim Clark, James Currie, Payman Eskandari, Shakhawat Hossain, Narad Rampersad, Anna Stokke, Ross Stokke, and Matthew Wiersma. 2024. “Fact-checking Research Claims about Math Education in Manitoba.” *Nonpartisan Education Review* 20(2): 1–47.
- Bergbauer, Annika, Eric Hanushek, and Ludger Woessman. 2018. “Testing.” NBER Working Paper 24836. Cambridge, MA: National Bureau of Economic Research. <https://doi.org/10.3386/w24836>.
- Boryga, Andrew. 2023. “How to Turn Your Math Classroom into a ‘Thinking Classroom’.” *Edutopia*. March 24. <https://www.edutopia.org/article/thinking-classroom-peter-liljedahl-math>.
- Binder, Carl. 1996. “Behavioral Fluency: Evolution of a New Paradigm.” *The Behavior Analyst*, 19(2), 163–197. <https://doi.org/10.1007/BF03393163>.
- CBC Radio. 2024. “Updated Reading Curriculum Moves to Embed Phonics and Fluency, Not Just Comprehension.” *The Current*. April 4. <https://www.cbc.ca/radio/thecurrent/updated-reading-curriculum-1.7313187>.
- Codding, Robin, Corey Peltier, and Jared Campbell. 2023. “Introducing the Science of Math.” *Teaching Exceptional Children* 56(1): 6–11. <https://doi.org/10.1177/00400599221121721>.
- Codding, Robin, Matthew Burns, and Gracia Lukito. 2011. “Meta-Analysis of Mathematic Basic-Fact Fluency Interventions: A Component Analysis.” *Learning Disabilities Research & Practice* 26(1): 36–47.
- Council of Ministers of Education (CMEC), Canada. 2012. *PCAP-2010 Contextual Report on Student Achievement in Mathematics*. Toronto: Council of Ministers of Education.
- CMEC, Canada. 2023. *Measuring Up: Canadian Results of the OECD PISA 2022 Study*. Toronto: CMEC.
- Crato, Nuno. 2021. “Setting up the Scene: Lessons Learned from PISA 2018 Statistics and Other International Student Assessments.” In *Improving a Country’s Education*, edited by Nuno Crato. Cham: Springer.
- DeChane, Darrin, Takako Nomi, and Michael Podgursky. 2024. “College and Career Ready: How Well Does 8th Grade MAP Performance Predict Post-Secondary Educational Attainment?” CALDER Working Paper No. 300-0524.
- Deans for Impact. 2015. *The Science of Learning*. Austin, TX: Deans for Impact.
- Drake, Glenn, Russell Noble, and Heather Peske. 2025. *Teacher Prep Review: Solving for Math Success*. Washington, DC: National Council on Teacher Quality. April.
- Duncan, Greg, and Katherine Magnuson. 2011. “The Nature and Impact of Early Achievement Skills, Attention Skills, and Behavior Problems.” In *Whither Opportunity?: Rising Inequality, Schools, and Children’s Life Chances*, 47–69.
- Education Quality and Accountability Office (EQAO). 2025. “Mathematics Proficiency Test.” <https://www.eqao.com/the-assessments/math-proficiency-test/>.
- EQAO. 2025. “EQAO Releases Assessment Results for 2024-2025 School Year.” <https://www.eqao.com/about-eqao/news-release/assessment-results-2025/>.

- Fuchs, Lynn, Douglas Fuchs, Carol Hamlett, and Pamela Stecker. (1991). "Effects of Curriculum-Based Measurement and Consultation on Teacher Planning and Student Achievement in Mathematics Operations." *American Educational Research Journal* 28(3): 617-641. <https://doi.org/10.3102/00028312028003617>.
- Fuchs, Lynn, Rebecca Newman-Gonchar, Rebecca Schumacher, Barbara Dougherty, Natalie Bucka, Karen Karp, John Woodward, Bradley Clarke, Nancy Jordan, Russell Gersten, Madhavi Jayanthi, Brenda Keating, and Sarah Morgan. 2021. "Assisting Students Struggling with Mathematics: Intervention in the Elementary Grades (WWC 2021006)." Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, US Department of Education.
- Gersten, Russell, Sybilla Beckman, Benjamin Clarke, Anne Foegen, Laurel Marsh, Jon Star, and Bradley Witzel. 2009. "Assisting Students Struggling with Mathematics: Response to Intervention (RtI) for Elementary and Middle Schools (NCEE 2009-4060)." Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, US Department of Education.
- Gibb, Nick. 2025. "From Decline to Top Rankings: How England Transformed Education with Nick Gibb." Interview by Anna Stokke. *Chalk & Talk* (podcast). May 30. <https://www.podbean.com/ew/pb-zps9p-18c1e97>.
- Gibb, Nick and Robert Peal. 2025. *Reforming Lessons: Why English Schools Have Improved Since 2010 and How This Was Achieved*. 1st ed. London: Routledge.
- Guilmois, Celine, Tom Rohmer, and Maria Popa-Roch. 2025. "Learning basic mathematic skills in primary school: testing the effectiveness of socio-constructivist and explicit instruction." *School Effectiveness and School Improvement*. <https://doi.org/10.1080/09243453.2025.2536485>.
- Hartman, Judith, Sarah Hart, Eric Nelson, and Paul Kirschner. 2023. "Designing Mathematics Standards in Agreement with Science." *International Electronic Journal of Mathematics Education* 18(3): em0739. <https://doi.org/10.29333/iejme/13179>.
- Hill, Heather, Brian Rowan, and Deborah Ball. 2005. "Effects of Teachers' Mathematical Knowledge for Teaching on Student Achievement." *American Educational Research Journal* 42(2): 371-406. <https://doi.org/10.3102/00028312042002371>.
- Hughes, Charles, Jared Morris, William Therrien, and Sarah Benson. 2017. "Explicit Instruction: Historical and Contemporary Contexts." *Learning Disabilities Research & Practice* 32(4). <https://doi.org/10.1111/ldrp.12142>.
- Kirschner, Paul, John Sweller, and Richard Clark. 2006. "Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching." *Educational Psychologist* 41(2): 75-86. https://doi.org/10.1207/s15326985ep4102_1.
- Liu, Xin, Kajsa Hansen, Valcke, Martin, and Jan Neve. 2024. "A Decade of PISA: Student-Perceived Instructional Quality and Mathematics Achievement across European Countries." *ZDM: The International Journal on Mathematics Education*. <https://doi.org/10.1007/s11858-024-01630-7>.
- Ma, Liping. 1999. *Knowing and Teaching Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the United States*. Mahwah, NJ: Lawrence Erlbaum Associates.

- Macintosh, Maggie. 2025. "A New Read on Literacy." *Winnipeg Free Press*. January 31. <https://www.winnipegfreepress.com/arts-and-life/2025/01/31/a-new-read-on-literacy>.
- _____. 2025a. "Probe into Literacy One of Human Rights Commission's Top Priorities." *Winnipeg Free Press*. January 16. <https://www.winnipegfreepress.com/breakingnews/2025/01/16/probe-into-literacy-one-of-human-rights-commissions-top-priorities>.
- _____. 2025b. "Changes to Certification Process for Teachers Went Too Far." *Winnipeg Free Press*. January 21. <https://www.winnipegfreepress.com/breakingnews/2025/01/21/changes-to-certification-process-for-teachers-went-too-far>.
- Maki, Kathrin, Anne Zaslosky, Robin Coddington, and Breanne Woods. 2024. "Math Anxiety in Elementary Students: Examining the Role of Timing and Task Complexity." *Journal of School Psychology* 106. <https://doi.org/10.1016/j.jsp.2024.101316>.
- Manitoba Human Rights Commission. 2025. *The ABCs of a Rights-Based Approach to Teaching Reading*. October. <https://www.manitobahumanrights.ca/education/pdf/public-consultations/supportingrighttoread.pdf>.
- Mayer, Richard. 2017. "Educational Psychology's Past and Future Contributions to the Science of Learning, Science of Instruction, and Science of Assessment." *Journal of Educational Psychology* 110: 174-179. <https://doi.org/10.1037/edu0000195>.
- McNeil, Nicole, Nancy Jordan, Amanda Viegut, and Daniel Ansari. 2025. "What the Science of Learning Teaches Us About Arithmetic Fluency." *Psychological Science in the Public Interest* 26(1): 10-57. <https://doi.org/10.1177/15291006241287726>.
- National Governors Association Center for Best Practices and Council of Chief State School Officers. 2023. "Common Core State Standards for Mathematics." Washington, DC: NGA Center and CCSSO, September. https://corestandards.org/wp-content/uploads/2023/09/Math_Standards1.pdf.
- National Mathematics Advisory Panel (NMAP). 2008. *Foundations for Success: The Final Report of the National Mathematics Advisory Panel*. Jessup, MD: US Department of Education.
- Nelson, Gena, Allyson J. Kiss, Robin S. Coddington, Nicole M. McKeivett, Johna F. Schmitt, Soyoung Park, Monica E. Romero and Jiyung Hwang. 2023. "Review of Curriculum-Based Measurement in Mathematics: An Update and Extension of the Literature." *Journal of School Psychology* 97: 1-42. <https://doi.org/10.1016/j.jsp.2022.12.001>.
- OECD. 2023. *PISA 2022 Results: The State of Learning and Equity in Education*. Vol. I. Paris: OECD Publishing.
- _____. 2024. *Education at a Glance 2024: OECD Indicators*. Paris: OECD Publishing. https://www.oecd.org/en/publications/education-at-a-glance-2024_c00cad36-en.html.
- Ontario Human Rights Commission. 2022. *Right to Read: Inquiry Report – Public Inquiry into Human Rights Issues Affecting Students with Reading Disabilities*. February 28. Government of Ontario. <https://www3.ohrc.on.ca/sites/default/files/FINAL%20R2R%20REPORT%20DESIGNED%20April%2012.pdf>.
- Ontario Ministry of Education. 2025. "Ontario Taking Action to Improve Student Achievement." <https://news.ontario.ca/en/release/1006809/ontario-taking-action-to-improve-student-achievement>.
- Poncy, Brian, Erica McCallum, and Ara Schmitt. 2010. "A Comparison of Behavioral and Constructivist Interventions for Increasing Math-Fact Fluency in a Second-Grade Classroom." *Psychology in the Schools* 47(9): 917-930.

- Poncy, Brian, Chris Skinner, and Kimberly Jaspers. 2007. "Evaluating and Comparing Interventions Designed to Enhance Math Fact Accuracy and Fluency: Cover, Copy, and Compare versus Taped Problems." *Journal of Behavioral Education* 16(1): 27–37.
- Poncy, Brian, Kathryn Jaspers, Paul Hansmann, Levita Bui, and William Matthew. 2015. "A Comparison of Taped-Problems Interventions to Increase Math Fact Fluency: Does the Length of Time Delay Impact Student Learning Rates?" *Journal of Applied School Psychology* 31: 63–82. <https://doi.org/10.1080/15377903.2014.963273>.
- Powell, Sarah, Elizabeth Hughes, Erica Lembke, Matthew Burns, Gena Nelson, Brian Poncy, Robin Coddington, Ben Clarke, Corey Peltier, and Genesis Arizmendi. 2025. "The NCTM/CEC Position Statement on Teaching Mathematics to Students with Disabilities: What's in It and What's Not." *Research in Special Education* 2. <https://doi.org/10.25894/rise.2796>.
- Province of British Columbia, Ministry of Education. 2016. *Mathematics K–9 elaborations*. BC Ministry of Education. https://curriculum.gov.bc.ca/sites/curriculum.gov.bc.ca/files/curriculum/mathematics/en_mathematics_k-9_elab.pdf.
- Richards, John. 2025. "The Case of the Boiling Frogs: Provincial Indifference to Declining Education Outcomes." E-Brief No. 369. Toronto: C.D. Howe Institute. <https://cdhowe.org/publication/the-case-of-the-boiling-frogs-provincial-indifference-to-declining-education-outcomes/>.
- Rosenshine, Barak. 2012. "Principles of Instruction: Research-Based Strategies That All Teachers Should Know." *American Educator* 36(1): 12.
- Saskatchewan Human Rights Commission. 2023. *Equitable Education for Students with Reading Disabilities: Report*. September 21. Government of Saskatchewan. <https://saskatchewanhumanrights.ca/wp-content/uploads/2023/09/Equitable-Education-for-Students-with-Reading-Disabilities-report.pdf>.
- Schleicher, Andreas. 2019. "Where 'Working Hard and Being Kind' Are Part of the Curriculum." *OECD Education Today*. November 20. <https://oecdeditoday.com/working-hard-and-being-kind/>.
- Siegler, Robert, Greg Duncan, Pamela Davis-Kean, Kathryn Duckworth, Amy Claessens, Mimi Engel, Maria Ines Susperreguy, and Meichu Chen. 2012. "Early Predictors of High School Mathematics Achievement." *Psychological Science* 23(7): 691–697.
- Stockard, Jean, Timothy Wood, Cristy Coughlin, and Caitlin Rasplika Khoury. 2018. "The Effectiveness of Direct Instruction Curricula: A Meta-Analysis of a Half Century of Research." *Review of Educational Research* 88(4): 479–507. <https://doi.org/10.3102/0034654317751919>.
- Stokke, Anna. 2024. "How to Build Automaticity with Math Facts." *Chalk & Talk* (podcast). November 8. <https://www.podbean.com/ew/pb-3ny3k-17323a9>.
- _____. 2015. *What to Do About Canada's Declining Math Scores*. Commentary 427. Toronto: C.D. Howe Institute. https://cdhowe.org/wp-content/uploads/2025/01/commentary_427.pdf.
- Sweller, John, Richard Clark, and Paul Kirschner. 2010. "Teaching General Problem-Solving Skills Is Not a Substitute for, or a Viable Addition to, Teaching Mathematics." *Notices of the American Mathematical Society* 57(10): 1303–1304.
- Timmons, Kristy. 2024. "Changes Are Coming to Ontario's Kindergarten Program – What Parents and Caregivers Need to Know." *The Conversation*, February 12.
- UK Department for Education. 2025. "Multiplication Tables Check." <https://www.gov.uk/government/collections/multiplication-tables-check>.

- VanDerHeyden, Amanda, Matthew Burns, Corey Peltier, and Robin Coddington. 2021. "The Science of Math: The Importance of Mastery Measures and the Quest for a General Outcome Measure." *Communiqué* 50(5).
- VanDerheyden, Amanda, and Benjamin Solomon. 2023. "Valid Outcomes for Screening and Progress Monitoring: Fluency Is Superior to Accuracy in Curriculum-Based Measurement." *School Psychology*. <https://doi.org/10.1037/spq0000528>.
- von Davier, Matthias, Ann Kennedy, Katherine Reynolds, Bethany Fishbein, Lale Khorramdel, Charlotte Aldrich, Allison Bookbinder, Ummugul Bezirhan, and Liqun Yin. 2024. *TIMSS 2023 International Results in Mathematics and Science*. Boston College, TIMSS & PIRLS International Study Center. <https://doi.org/10.6017/lse.tpisc.timss.rs6460>.
- Werner, Kevin, Gregory Acs, and Kristin Blagg. 2024. "Comparing the Long-Term Impacts of Different Child Well-Being Improvements." Washington, DC: Urban Institute.

This E-Brief is a publication of the C.D. Howe Institute.

Anna Stokke is a Professor in the Department of Mathematics & Statistics at the University of Winnipeg and an Adjunct Professor in the School of Education at La Trobe University.

This E-Brief is available at www.cdhowe.org.

Permission is granted to reprint this text if the content is not altered and proper attribution is provided.

The views expressed here are those of the author and are not attributable to their respective organizations. The C.D. Howe Institute does not take corporate positions on policy matters.