Environmental Scan and Artificial Intelligence:

PISA Performance and Policy Signals in Canada

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Purpose and Scope

An environmental scan gathers evidence from across a field in order to identify the conditions, pressures, and emerging trends that a decision-maker should be aware of. This scan examines the state of Canadian secondary education as measured by the Programme for International Student Assessment, and it uses an artificial intelligence tool, NotebookLM, to assemble and interrogate the source material. The scan therefore has two objects: the Canadian evidence itself, and the usefulness and limitations of an AI research assistant in producing that evidence.

The scope is deliberately bounded. The scan covers PISA results for Canada from 2003 through 2022, the most recent cycle for which results have been published, together with the commentary and national reporting that interpret those results. It does not attempt to cover the entire Canadian education system, and it does not include provincial assessment data outside PISA.

Method: Building and Querying the Source Corpus

NotebookLM is a research assistant that restricts its responses to a corpus of documents supplied by the user, and it attaches citations to the specific passages on which each statement is based. That constraint is what makes it appropriate for an environmental scan: unlike a general-purpose chatbot, it cannot introduce material from outside the uploaded sources, so every claim can be traced back to a document the researcher selected.

The scan was conducted in five steps.

1. Sources were selected and uploaded. Five documents were loaded into a single NotebookLM notebook: the OECD PISA 2022 international report (Volume I), the OECD country note for Canada, the Council of Ministers of Education, Canada national report Measuring Up, Richards's C.D. Howe Institute commentary "Red Flags for Educators," and the TED Blog article "4 Surprising Lessons About Education From Data Collected Around the World." The mix was intentional: two primary data sources, one national interpretation, and two secondary commentaries offering competing framings.
2. A briefing document was generated. NotebookLM's summary function produced an initial overview across all five sources, which was used to identify recurring themes rather than to draw conclusions.
3. The corpus was queried with targeted questions. These included what the sources say about the direction of Canadian mathematics performance, whether the decline predates the pandemic, how provinces differ, how gender differences appear across domains, and what factors beyond spending are associated with performance.
4. Each cited claim was verified against the original source. Every statement NotebookLM attributed to a document was checked in that document before being used, and figures were confirmed against the OECD tables rather than accepted from the summary.
5. Points of disagreement between sources were identified and retained. Where the commentaries framed the same data differently, the difference was recorded as a finding rather than resolved into a single narrative.

The verification step in particular proved necessary rather than precautionary, and its results are discussed in the section on the limitations of the process.

Findings: Performance Trends

Canada remains a strong performer in absolute terms. In PISA 2022, Canadian 15-year-olds averaged 497 in mathematics against an OECD average of 472, and 507 in reading against an OECD average of 476 (OECD, 2023b). Canada is also one of only ten countries and economies combining a large share of students with basic proficiency across all three domains with high socio-economic fairness (OECD, 2023a).

The trend, however, runs downward. Average 2022 results were lower than 2018 in both mathematics and reading, and in both domains performance was lower than in any previous PISA cycle (OECD, 2023b). The national report confirms that mathematics scores fell in every province except Prince Edward Island and Alberta (Council of Ministers of Education, Canada, 2023).

The most policy-relevant finding is that this decline is not simply a pandemic effect. The OECD identifies Canada explicitly among the countries where negative trends in mathematics were already apparent before 2018 (OECD, 2023a). Richards (2017) had documented the same trajectory from the 2003 to 2015 cycles well before COVID-19 school closures, which means his warning has since been confirmed by two further cycles of data. Treating the decline as a temporary disruption would therefore misread the evidence.

Findings: Equity and Variation

Canada’s equity performance is genuinely strong relative to the OECD, but the national average conceals internal variation. Richards (2017) identified persistent regional gaps, with several smaller provinces scoring consistently below the national average, and the 2022

provincial results continue to show uneven movement across jurisdictions (Council of Ministers of Education, Canada, 2023).

Gender differences are more nuanced than a simple summary suggests, and this is a point where consulting the primary source changed the finding. In Canadian mathematics, the share of low performers is nearly identical for boys and girls at 21 percent and 22 percent respectively, but the share of top performers is larger among boys at 15 percent against 10 percent. In reading the pattern reverses, with 22 percent of boys below Level 2 compared with 14 percent of girls (OECD, 2023b). The gender question in Canada is therefore less about average scores than about the distribution at the tails, and between 2012 and 2022 mathematics performance declined to a similar extent for both.

Findings: What the Numbers Do Not Explain

The scan's secondary sources are useful precisely because they address what the scores cannot show. Torgovnick May (2013) summarizes PISA analysis indicating that higher spending per student does not reliably produce higher performance; how resources are allocated, including toward teacher development and instructional time, matters more than the total. The same source notes that extracurricular provision is associated with performance gains even after socio-economic status is controlled, and that the apparent advantage of private schooling often disappears once background is accounted for.

Taken together with the Canadian trend data, this supports a specific conclusion. Canada's problem is not a resourcing shortfall of the kind that would be solved by spending alone, nor a collapse in overall standing. It is a sustained, pre-pandemic erosion in mathematics that varies by province, which points toward curriculum, instructional practice, and teacher capacity rather than toward funding levels as the place to look.

Limitations of the AI-Assisted Process

NotebookLM was effective at surfacing themes across five documents quickly and at locating supporting passages, which compressed a task that would otherwise have taken considerably longer. Its citation behavior made verification straightforward, since each claim pointed to a specific passage rather than to a document as a whole.

Three limitations were nonetheless clear. First, the tool summarizes what the corpus contains and cannot identify what the corpus omits; a scan assembled from five sources chosen by the researcher inherits every gap in that selection, and the tool gives no signal that a gap exists. Second, summarization flattens disagreement. Where sources framed the same data differently, the initial briefing tended to merge them into a single account, and the differences had to be recovered deliberately through targeted questioning. Third, the tool reports what sources say without weighing their authority, so an OECD data table and a blog post are treated as equivalent inputs unless the researcher distinguishes them.

The appropriate conclusion is that NotebookLM accelerated the mechanical portion of the scan while leaving the analytical judgments unchanged. Source selection, verification, and the weighing of competing interpretations remained entirely the researcher’s responsibility, and the quality of the scan depends on those decisions rather than on the tool.

Conclusion

Canada is not failing, but the evidence does not support complacency. The country remains above the OECD average in all three domains and continues to combine strong performance with genuine equity, yet mathematics has declined across two decades, the decline began before the pandemic, and it is unevenly distributed across provinces. The most defensible policy response is targeted rather than general: sustained attention to mathematics instruction and

teacher capacity, differentiated by jurisdiction, informed by the contextual factors PISA collects alongside its test scores rather than by score comparison alone.

As an exercise in AI-assisted research, the scan suggests that tools of this kind change the cost of gathering evidence without changing the requirements for judging it. That distinction matters for educational technology leadership, because the risk is not that such tools produce poor summaries but that they make a narrow evidence base feel comprehensive.

References

Council of Ministers of Education, Canada. (2023). *Measuring up: Canadian results of the OECD PISA 2022 study*. https://cmec.ca/docs/pisa2022/PISA-2022_Highlights_FINAL_EN.pdf

OECD. (2023a). *PISA 2022 results (Volume I): The state of learning and equity in education*. OECD Publishing. https://doi.org/10.1787/53f23881-en

OECD. (2023b). *PISA 2022 results (Volume I and II) — Country notes: Canada*. OECD Publishing. https://doi.org/10.1787/901942bb-en

Richards, J. (2017). Red flags for educators: Lessons for Canada in the PISA results. *C.D. Howe Institute Commentary*.

Torgovnick May, K. (2013, December 3). 4 surprising lessons about education from data collected around the world. *TED Blog*.