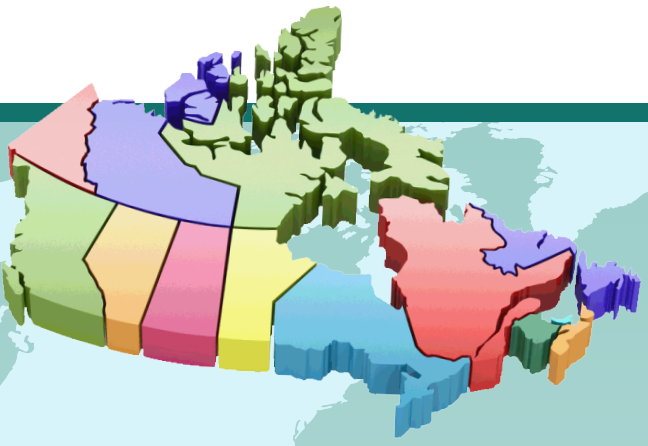
Measuring up: Canadian Results of the OECD PISA 2015 Study

The Performance of Canadian 15-Year-Olds in Collaborative Problem Solving

Highlights



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What is PISA?

The Programme for International Student Assessment (PISA) is a collaborative effort among member countries of the Organisation for Economic Co-operation and Development (OECD). Conducted every three years, it is a survey of 15-year-old students from around the world. PISA assesses the students' levels of key knowledge and skills that are essential for full participation in modern societies. The survey measures the core subject areas of reading, mathematics, and science, as well as an innovative domain. In 2015, the innovative domain was computer-based collaborative problem solving.

PISA focuses on students' abilities to apply knowledge and skills and to analyze, reason, and communicate effectively as they examine, interpret, and solve problems. Through a student background questionnaire, PISA also asks students about their motivation, beliefs about themselves, and learning strategies. The PISA results can help educators, policy-makers, and the public identify how education systems are similar and different, but these results cannot directly identify cause-and-effect relationships between policies and student performance.

The PISA 2015 framework defines collaborative problem solving through four individual problem-solving processes and three collaborative problem-solving competencies as "the capacity of an individual to effectively engage in a process whereby two or more agents attempt to solve a problem by sharing the understanding and effort required to come to a solution and pooling their knowledge, skills and efforts to reach that solution."[1]

PISA's individual problem-solving processes are:

- exploring and understanding,
- representing and formulating,
- planning and executing, and
- monitoring and reflecting.

PISA's collaborative problem-solving competencies are:

- establishing and maintaining shared understanding,
- taking appropriate action to solve the problem, and
- establishing and maintaining team organization.

In total, over 500,000 15-year-olds from 72 countries and economies participated in PISA 2015, of which approximately 20,000 were from Canada. Out of these countries and economies, 52 participated in the collaborative problem-solving option of PISA 2015, including the 10 Canadian provinces.

[1] OECD, *PISA 2015 assessment and analytical framework: Science, reading, mathematic, financial literacy and collaborative problem solving,* revised edition (Paris: OECD Publishing, 2018), available at https://www.oecd-ilibrary.org/education/pisa-2015-assessment-and-analytical-framework/pisa-2015-mathematics-framework_9789264281820-5-en.

PISA 2015 Collaborative Problem Solving *Highlights*

Equipping students with collaboration skills, in addition to developing their cognitive abilities, is increasingly a goal of today's education systems. Despite the increased importance placed on collaboration skills, very few attempts have been made to assess how well students collaborate with one another. To address this data gap, PISA 2015 introduced for the first time a collaborative problem-solving assessment to measure the ability of 15-year-olds to collaborate in order to solve problems.

Canadian students achieve a high level of proficiency in collaborative problem solving

In PISA 2015, 82 per cent of Canadian students and 72 per cent of students in OECD countries performed at or above Level 2 in collaborative problem solving, contributing to a collaborative effort to solve a problem of medium difficulty. Among 52 countries and economies that participated in the collaborative problem-solving assessment of PISA 2015, only Japan, Singapore, Korea, Hong Kong–China, Macao–China, and Estonia had a significantly higher proportion of students performing at or above Level 2 than Canada.

Canadian students had an average score of 535, well above the OECD average of 500. Of all the participating countries and economies, only Singapore and Japan outperformed Canada.

All Canadian provinces perform above the OECD average

At the provincial level, only students in British Columbia performed above the Canadian average in collaborative problem solving. With an average score of 561, they performed as well as students in Singapore and were not surpassed by any other participating country or economy.

Students in Prince Edward Island, Nova Scotia, Quebec, Ontario, and Alberta performed at the Canadian average, while students in Newfoundland and Labrador, New Brunswick, Manitoba, and Saskatchewan performed below the Canadian average. All provinces scored above the OECD average in collaborative problem solving.

	Better than Canada	As well as Canada
Collaborative problem-solving performance	**British Columbia**, Japan, Singapore	**Alberta**, Australia, Estonia, Finland, Hong Kong–China, Korea, Macao–China, New Zealand, **Nova Scotia**, **Ontario**, **Prince Edward Island**, **Quebec**

Canada's top performers score higher in collaborative problem solving than their OECD counterparts but there is a bigger gap between high- and low-achievers

The gap that exists between students with the highest and those with the lowest levels of performance is an important indicator of the equity of education outcomes. This gap was more substantial in Canada than across the OECD countries; the larger achievement disparity in Canada can be attributed in part to the fact that students in the highest decile in Canada scored much higher than those across the OECD countries. Differences between the highest and lowest performance range from 252 points in Quebec to 274 points in Manitoba.

There are variations in collaborative problem solving by gender—girls outperform boys—and other demographic factors

Girls performed significantly better than boys in collaborative problem solving in all participating countries and all provinces. On average across OECD countries, girls outperformed boys in collaborative problem solving by 29 points, while in Canada this difference was 39 points. At the provincial level, the gender gap favouring girls ranged from 24 points in Quebec to 61 points in Prince Edward Island.

In Canada overall, there was no difference between immigrant and non-immigrant students in average collaborative problem-solving scores. In contrast, across OECD countries, non-immigrant students scored on average 23 points higher than second-generation students and 46 points higher than first-generation students. Provincially, performance gaps in collaborative problem solving were observed in Saskatchewan (29 points), Manitoba (21 points), and Alberta (19 points), with non-immigrant students scoring higher than their first-generation immigrant counterparts. No statistically significant differences in performance between non-immigrant and second-generation immigrant students were found in any of the provinces.

On average across OECD countries, socioeconomically advantaged students outperformed socioeconomically disadvantaged students by 69 points in collaborative problem solving; in Canada, the difference was 63 points. At the provincial level, the gap in favour of advantaged students ranged from 46 points in Newfoundland and Labrador to 68 points in Quebec, with no significant difference in collaborative problem solving observed between the two groups in Prince Edward Island.

In most Canadian provinces, students in majority-language school systems have higher performance in collaborative problem solving than students in minority-language school systems

At the pan-Canadian level, the difference in collaborative problem solving between students in anglophone school systems and those in francophone school systems was not statistically significant. However, students in majority-language school systems (those in anglophone schools in all provinces except Quebec) outperformed their peers from minority-language school systems in all provinces except Quebec, where no significant difference was observed.

Globally, most students tend to value teamwork and relationships

In Canada, the provinces, and across participating countries and economies, the majority of students responded positively to the statements that constitute the indices of valuing teamwork (i.e., "I prefer working as part of a team to working alone," "I find that teams make better decisions than individuals," "I find that teamwork raises my own efficiency," and "I enjoy cooperating with peers") and of valuing relationships (i.e., "I am a good listener," "I enjoy seeing my classmates be successful," "I take into account what others are

interested in," and "I enjoy considering different perspectives"). Students in Canada valued relationships more than did students in OECD countries but valued teamwork similarly.

Boys are more likely than girls to value teamwork

On average across Canada and in almost all participating countries and economies, boys were more likely than girls to value teamwork. Furthermore, gender differences in favour of boys were more pronounced in Canada than on average across OECD countries.

Across most countries and all provinces, more girls than boys report valuing relationships

In contrast with the findings pertaining to the gender difference in valuing teamwork, girls in Canada and across OECD countries were significantly more likely than boys to value relationships. Moreover, the gender difference in favour of girls was statistically significant in 44 of the 52 countries and economies that participated in the collaborative problem-solving assessment.

Valuing teamwork is negatively correlated with performance in collaborative problem solving

In Canada, valuing teamwork is negatively related to performance in collaborative problem solving, as an increase of one unit on the index of valuing teamwork corresponds with a decline of 15 points in scores in collaborative problem solving in Canada overall. As well, the 25 per cent of Canadian students who valued teamwork the least scored 48 points higher, on average, than the 25 per cent of students who valued teamwork the most.

However, the associations between valuing teamwork and students' performance in collaborative problem solving were no longer statistically significant in Canada or any of the provinces after accounting for performance in science, reading, and mathematics, and when student gender and socioeconomic profile were accounted for.

Valuing relationships is positively correlated with performance in collaborative problem solving

At the pan-Canadian level, valuing relationships is positively related to performance in collaborative problem solving. On average across Canada, an increase of one unit on the index of valuing relationships corresponds with a 12-point improvement in collaborative problem-solving performance, with the 25 per cent of students who reported valuing relationships the most scoring 23 points higher than the 25 per cent of students who reported valuing relationships the least.

However, after accounting for students' performance in the three core PISA subjects (science, reading, and mathematics) as well as gender and socioeconomic profile, the association between valuing relationships and performance in collaborative problem solving was found to no longer be statistically significant in Canada.

Performance in collaborative problem solving relates positively to performance in other PISA subject areas

In Canada, student performance in mathematics, reading, and science is positively associated with performance in collaborative problem solving. Although these correlations are fairly high, they are lower than those among the three core areas themselves and far from absolute determinants of performance. That being said, Canada

is among the few high-performing countries where students' performance in collaborative problem solving provides a good indication of their expected performance in mathematics, reading, and science.

Countries that performed well in the PISA 2012 individual problem-solving assessment tend to perform well in the PISA 2015 collaborative problem solving

There is a strong correlation between the mean scores of the individual problem-solving assessment in PISA 2012 and the collaborative problem-solving assessment in PISA 2015: countries and economies that performed well in individual problem solving in PISA 2012 also tended to perform well in collaborative problem solving in 2015. In Canada and across all provinces, with the exception of Prince Edward Island, students performed above the OECD average on both assessments. In Prince Edward Island, students performed below the OECD average on the 2012 individual problem-solving assessment but above the OECD average on the 2015 collaborative problem-solving assessment.

Looking forward

The results of this first large-scale collaborative problem-solving assessment showed that Canadian students were among the top performers internationally, surpassed by students in only one OECD country and one non-OECD country. These results mirror those in the three PISA core subjects, where Canada was found to be near the top of each set of rankings.

Today's workplaces require people to have the social skills and attitudes to work together in a diverse environment and to solve problems in teams. Innovative work is often the fruit of the sharing of knowledge and creative ideas between people of different countries, cultures, and linguistic backgrounds. Education systems, parents, and the community at large need to foster the social and collaborative skills that students will need to succeed.

Further Canadian results are available in the report **Measuring up: Canadian Results of the OECD PISA 2015 Study—The Performance of Canadian 15-Year-Olds in Collaborative Problem Solving**.

This publication is available electronically at: www.cmec.ca.