Future Skills Centre Centre des **Compétences futures**

Skills for Productivity, Prosperity and Well-Being in Canada

A Canadian PIAAC Research Agenda

SHIFT insights

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Executive Summary

- The OECD's Programme for the International Assessments of Adult Competencies (PIAAC) is a valuable global survey of adult skills data and an essential resource that could help Canada generate better strategies to improve our skills landscape, productivity, prosperity and well-being.

- With the release of new PIAAC data, Canada has a once-in-a-decade opportunity to design and execute a research agenda that can fill knowledge gaps, identify exactly why and how skills matter to economic and social outcomes, and help shape policies and programs to improve Canada's performance.

- Canadian research using PIAAC data tends to focus on skills as outcomes – including proficiency levels, distribution, and the acquisition and deterioration of skills in the adult population. Few studies emphasize skills as a driver of productivity, prosperity and well-being in Canada.

- A Canadian PIAAC Research Agenda should emphasize research initiatives that focus on skills as drivers (of productivity, prosperity and well-being), skills as outcomes (including their distribution and mechanisms of their acquisition and deterioration), and be supported by robust data infrastructure and enabling conditions (including accessible and linked data, and a Community of Practice to shape priorities, construct methodologies, and share insights).

- If Canada is to effectively address its major productivity and growth challenges, we will need a better understanding of exactly how skills play a role and how they can help drive improvements. A Canadian PIAAC Research Agenda offers an important step towards that goal.

Introduction

Canada is in the midst of a productivity and growth challenge.

Part of the issue is skills. While Canada has one of the most highly educated populations in the world, the distribution and use of skills across the adult population is uneven. This is evident in results from the OECD's Programme for the International Assessments of Adult Competencies (PIAAC) – an international survey of hundreds of thousands of adults, including nearly 40,000 in Canada, over two cycles of data collection. New PIAAC data released at the end of 2024 provides Canada with an opportunity to improve understanding of relationships among skills, productivity, prosperity and well-being, and to use that knowledge to design better policies and programs.

Researchers using PIAAC data have generated useful insights that have informed skills policies and programs across Canada. However, attention to PIAAC has fluctuated over the years. Many appear interested only in PIAAC as a once-a-decade snapshot of Canada's relative global standing on skills. Not seeing any glaring problems with Canada's ranking, attention predictably wanes. This is unfortunate as PIAAC has substantial, longer-term value: By using PIAAC data to better understand who has skills, how they are used, and how they change over time, researchers can help us identify strengths, gaps and areas for improvements in skills policies and programs.

With the release of the second cycle of PIAAC, Canada has an opportunity to build on past work and explore some critical, albeit neglected, research themes that speak to our larger productivity and growth challenges: Why and how do adult skills matter? What difference do they make to labour market outcomes, to sector-Answers to these kinds of questions should clarify how skills can be used to improve productivity, prosperity and well-being in Canada.

Canada is in no position to leave pieces of the productivity puzzle on the floor. Pursuing these questions using PIAAC – and maintaining support for the data collection and analysis that enables researchers to do so – is an important part of a well-informed and effective social and economic strategy.

Report Purpose and Structure

With limited resources, Canada needs to make strategic decisions about what kinds of PIAAC-related research to prioritize. Additionally, we need to ensure that the data are widely available, usable, and properly understood by users. This report addresses these issues. We review and analyze themes and gaps in previous research using PIAAC, critically assess PIAAC instruments and data, and share insights from interviews with researchers and practitioners in Canada's skills community to shape priorities for a Canadian PIAAC Research Agenda.

If pursued, the research agenda should reveal insights about why and how skills matter to productivity, growth, good jobs, health, and well-being; which specific skills are associated with high-performing individuals and economic sectors; and how the skills that matter are distributed among adults in Canada. These insights, in turn, would provide a strong foundation for more targeted and effective policies and strategies to develop and deploy the skills that matter to prosperity and well-being. In short, what is PIAAC? Why does it matter? And how can we use it to improve Canada's economic and social well-being?

The next section offers an overview of the PIAAC survey and data, including its limitations, to orient users to its potential and weaknesses. In section III, we present the results of a systematic review of Canadian-focused studies that use PIAAC, highlighting key findings as well as gaps and unanswered questions. Drawing on insights from the literature review, interviews, and gap analysis, section IV presents a Canadian PIAAC Research Agenda including topics and enabling conditions for using the data, conducting research, and sharing results. The report concludes by emphasizing the importance of prioritizing research about why and how skills matter to Canada's economic, social and political well-being.

What is PIAAC?

The Programme for the International Assessment of Adult Competencies (PIAAC), is the largest international survey that provides insights on the levels and use of skills among adults aged 16 to 65.

While recognized for tracking performance on three key skills areas – literacy, numeracy and problem-solving – PIAAC is a much more intensive and robust survey that provides insights on a wide range of adult skills issues, including:

- performance on skills and competencies that underlie personal and societal success;

- the distribution of skills across a variety of subpopulations;

- how skills are used in workplaces;

- why and how skills matter to a range of social, health and economic outcomes;

- factors related to skills acquisition and decline;

- how education and training systems contribute to skills development; and

- policy levers that can be used to enhance competencies.[1]

The data that informs these insights are collected through two main components of PIAAC: A skills assessment component and a background questionnaire.

Skills Assessment

The skills assessment component tests individual proficiency in three information-processing skills essential for work and daily life: literacy, numeracy, and problem-solving in technology rich environments (PS-TRE). In Cycle 2 of PIAAC, PS-TRE was replaced with adaptive problem solving (APS). (See Appendix A - Table 1). Proficiency is tested along a continuum* using novel, complex individualized computer-based assessments, with results reported by the OECD on a 500-point scale. One might think of this as the **skills supply** dimension of PIAAC.

- **Literacy** is the ability to understand, evaluate, use and engage with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential. It encompasses a range of skills from decoding written words and sentences to comprehension, interpretation and evaluation of complex texts.

- **Numeracy** is the ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of situations in adult life.

- **Problem-solving in technology rich environments (PS-TRE)** (PIAAC Cycle 1) is defined as using digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks, including solving problems for personal, work and civic purposes by setting up appropriate goals and plans, and accessing and making use of information through computers and computer networks.

- **Adaptive problem-solving (APS)** (PIAAC Cycle 2) is general problem solving that is relevant to a range of information environments and contexts (i.e., including, but not limited to, digitally embedded problems). It includes dynamic and adaptive aspects of problem solving (e.g., the capacity to react to changes and new information that emerge during the process) and metacognition (i.e., a capacity to reflect on the process of problem solving as it takes place, including monitoring progress, adjusting goals and strategies in the light of new information and situations).

The skills assessment component also includes questions that reveal insights about **skills demand** – specifically, how skills are used in workplaces and how demand for skills is evolving. A major driver for this component is to collect information that enables analysis of the match or mismatch between the qualifications and skills workers have and those they use in their jobs. Survey participants are also asked whether they feel over or under-qualified for their roles.

To capture skills demand, PIAAC uses a Job Requirements Approach (JRA) that asks currently employed respondents and those who were employed in the past 12 months about the level and extent to which their jobs require the use of various skills domains, including the three information processing skills – literacy, numeracy and problem solving (PS-TRE or APS) – as well as a range of technology, interaction, learning, organization and physical skills.

Background Questionnaire

PIAAC also includes a robust background questionnaire that asks further questions about skills and their use, labour market outcomes, participation in education and training, health and social participation, as well as demographic questions that help analysts understand how skills are distributed, how they develop and deteriorate, and other policy-relevant insights. The background question data offer a critical resource to understand skills value, use and acquisition (See Appendix 1 - Table 2).

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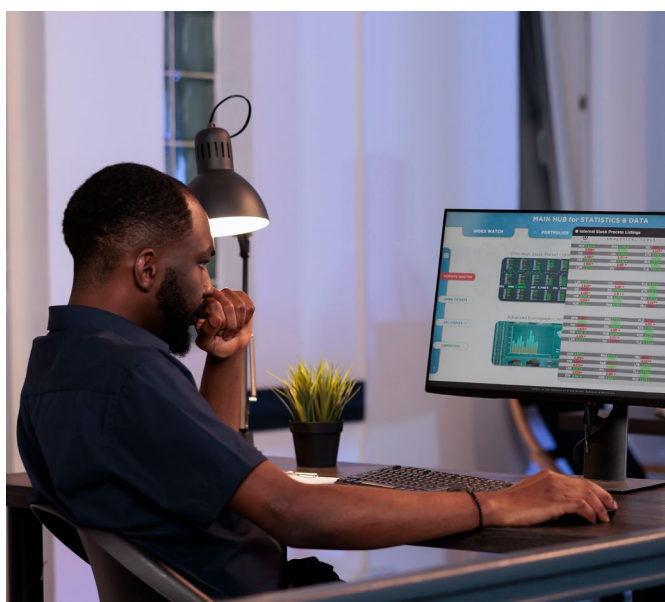
* At the low end of the proficiency scale, "individuals have skills that allow them to undertake tasks of limited complexity, such as locating single pieces of information in short texts in the absence of other distracting information, or performing simple mathematical operations involving a single step, such as counting or ordering. At the highest level of proficiency, adults can undertake tasks that involve integrating information across multiple dense texts, reasoning by inference, working with mathematical arguments and models, and solving complex problems using information technologies that require navigation and the use of multiple tools."

Coverage

PIAAC generates a substantial dataset for analysis. Cycle 1 was conducted over three rounds between 2011 and 2018 (Canadian data was collected in 2012) by surveying roughly 245,000 individuals.[†] With 27,285 respondents, Canada had by far the largest sample of any of the 39 participating countries. Moreover, Canada oversampled many subpopulations to enable detailed analysis – including examination of Indigenous peoples' and immigrants' skills – and large province-level responses to allow for inter-regional comparisons.

Cycle 2 data collection began in 2022 and was released in December 2024. There were roughly 160,000 respondents in 31 countries. Canada collected 11,697 responses – much lower than in Cycle 1, but a sufficiently large sample for rigorous analysis. [‡]

Limitations

PIAAC is a useful tool for understanding adult skills. At the same time, there are limitations about which researchers and others should be aware when using the data.

- **Sample size.** Canada oversampled many subpopulations in Cycle 1 which allowed for analysis of the distribution of skills among different adult populations. Still, the sample was not large enough for more granular regional and demographic analyses. Canada's Cycle 2 sample is smaller, which will constrain certain kinds of analysis.

- **Data linkages.** Some researchers circumvent the sample size issue by linking PIAAC data to Census and other datasets. However, most data linking exercises have been one-off efforts conducted by individual researchers rather than ecosystem-wide initiatives that could benefit all users. Interviewees suggested that Statistics Canada should proactively create links between PIAAC and other datasets to enable research – including links to Census, Tax and other administrative datasets.[2]

- **Complexity.** PIAAC's complex methodologies require training and data skills to understand and use effectively. While there are resources to help researchers access, understand and use PIAAC data,

there are nuances that demand higher expertise. In some cases, potential users might simply abandon their efforts; in other cases, researchers might misuse the data unaware of their missteps.

- **Longitudinal analysis.** Cycle 1 was designed to enable comparisons with previous adult skills surveys. (See Textbox "PIAAC and Its Predecessors"). However, the use of new methodologies, different survey samples and variations in question language made comparisons practically challenging. As a result, longitudinal analyses were effectively off the table. Cycle 2 offers some opportunities for certain kinds of longitudinal analysis.

Additional concerns have emerged with Cycle 2 PIAAC data. Notably:

- Canada's Cycle 2 **sample is smaller** which limits demographic and regional analyses.

- There are **fewer participating countries** which constrains global comparisons.

- The shift from problem-solving in technology rich environments to adaptive problem solving in Cycle 2 introduces **challenges for comparing problem-solving** over time.

- The introduction of a **"door questionnaire"** to estimate some participants' skills (where rigorous testing was not possible) generates an analytical wrinkle – especially as "door questionnaire" participants have lower estimated skills than those formally tested.

- Cycle 2 data were collected during the **COVID-19 pandemic** raising questions about the extent to which results reflect a proper snapshot of skills, employment, health and other variables, or a temporary departure from longer-term trends.

[†] The first round took place between 2011 and 2012 in 25 countries including Canada; the second round occurred in 2014 and 2015 in 9 countries; and the third round took place in 2017 and 2018 in 5 new countries. The United States was sampled in two rounds, but counted only once in the 39 total countries.

[‡] According to some experts, the lack of pre-formed data linkages results in a vicious cycle whereby researchers will not use PIAAC data because not linked, signalling to Statistics Canada that demand for PIAAC data is limited and therefore not worth investing in making links leading, in turn, to further declines in potential research use. PIAAC then exists as a kind of orphaned dataset that does not get the support it needs to generate its full potential.

PIAAC and Its Predecessors

PIAAC is the latest in a series of international surveys that assess individual proficiency in key information processing skills like literacy and numeracy. The first was the International Adult Literacy Survey (IALS) which ran from 1994 to 1998 and covered 22 OECD countries. The second was the Adult Literacy and Life Skills Survey (AALS), which ran from 2002 to 2007 and covered 9 countries. While PIAAC's designers aimed to connect to and build on these previous surveys by using a similar methodology, focus (i.e., skills domains), and breadth of country coverage, differences in the final methodology and country coverage make comparison among IALS, AALS and PIAAC challenging and limited.

There have also been efforts to align PIAAC with the OECD's Programme of International Student Assessment (PISA) survey, which focuses on the skills of those aged 15. A few countries, including Canada, developed longitudinal connections between PISA and PIAAC by sampling the same individuals (at different ages) in both surveys, which enables research that explores how skills are developed in school, their role in school to work transitions, and how they change over the lifecourse.

What Have We Learned From PIAAC Research?

Research and analysis using Cycle 1 PIAAC data have generated useful insights about skills levels, acquisition and distribution, as well as some indication of the value of and returns to skills, including labour market outcomes, health and well-being.

That said, research has focused mainly on skills as outcomes and comparative metrics. Studies that examine skill use and skills as drivers of economic and social performance, are less prominent. Cycle 1 research says much about who has skills, but not why policymakers, practitioners and others should care.

Skills as Outcomes and Comparative Metrics

Skills Levels in Canada and Globally

Cycle 1 provided good, representative data across 49 countries, allowing researchers to benchmark Canada's skills performance with international peers. While benchmarking provides little in the way of specific policy-relevant insights, it can be useful to highlight areas where countries excel or lag – which, in turn, can prompt examination of causes and solutions.

- Research by Statistics Canada and CMEC in 2013 focused on Canada's comparative performance on the primary information processing skills (i.e., literacy, numeracy, and PS-TRE). It showed that Canada ranked above the OECD average in PS-TRE, lagging only Sweden in the proportion of the population scoring at the highest level of proficiency. Canada ranked at the OECD average in literacy, with larger portions of the population in the lower and higher ends of the literacy spectrum. Canada ranked below average in numeracy, with the proportion of the population in the lower end above the OECD average.[3] (See Textbox "Skills Proficiency Among Canada's Adult Population").

- Other research in this vein raised concerns. Between 2003 and 2011, Canadians gained an average of one year of schooling and, based on our understanding of the relationship between education and skills, Canada should have seen a corresponding improvement in overall literacy scores. In fact, Canada's average literacy score declined by 7 points, resulting in a 15 point gap between actual and expected scores.[4]

How are skills distributed among different populations?

Other research using Cycle 1 PIAAC data examined how skills proficiency is distributed across populations in order to identify where interventions are needed to achieve more equitable proficiency. While Canada performs well in the aggregate, there are inequities that track Indigenous identity and immigration status, and variations by gender and age.[5]

- Cycle 1 data show that skills among **Indigenous** adults are, on average, lower than the Canadian average, although there is variation by region, language and specific Indigenous identity.[6] Métis people, for example, scored above the Canadian average in literacy, and only slightly below in numeracy skills.[7] Maslov and Zhong (2018) found that many Indigenous peoples had lower literacy and numeracy scores than non-indigenous people working in the same occupation. Numerous studies indicate that lower educational attainment among Indigenous peoples largely explain skill proficiency gaps and suggest that lifting educational achievement could help close the gaps.[8]

- Other studies found that **recent immigrants** score significantly lower in all three skills domains than the Canadian average.[9] Lower proficiency among recent immigrants is largely a reflection of limited proficiency in English or French – the languages of PIAAC testing in Canada. Recent immigrants proficient in English or French tended to score much better (albeit still below the Canadian average) on the PIAAC skills domains.[10]

- While several studies find no significant **gender** differences at the national level in literacy and PS-TRE, there is a pattern of lower numeracy proficiency among women relative to men – a gap that grows with age.[11] The patterns are not unique to Canada. Using both PIAAC and PISA data (that captures 15 year olds' proficiency in literacy, numeracy and science), Encinas-Martin and Cherian (2023) found that, at age 15, girls outperform boys in literacy, while boys outperform girls in numeracy across all OECD countries. While the gender gap in numeracy persists into adulthood, the gap in literacy is virtually closed by adulthood. Mueller, Truong, and Smoke (2018) find that women in Canada generally have higher proficiency when it comes to PS-TRE, but are less represented in tech occupations – an indication of gender discrimination in the sector.

- Research on the distribution of skills looks at the relevance of **age**. OECD (2013, 2016, 2017), Barrett and Riddell (2016), and Paccagnella (2016) all find that information processing proficiency peaks around the age of 30 and then slowly declines as people age. The research also shows that differences in skills proficiencies by age in Canada and a few peers (U.S., England, and the Nordics) are among the widest in the OECD.[12]

- Other research revealed that across the Canadian labour market, workers in professional, scientific and technical sectors tend to have higher proficiency in all three skill areas.[13]

What influences skills acquisition and decline?

Building on research that identified differences in proficiency among populations, a suite of related studies investigated possible explanations for those differences as well as behaviours that influence skills acquisition and retention.

- A handful of studies explored the **relationship between educational attainment and skills** proficiency and revealed a strong correlation between the two, albeit with variation by age, gender and field of study.[14] Other studies found robust relationships between parental education and skills proficiency indicating the strong influence of social capital and upbringing on skills acquisition.[15]

- **Adult learning** opportunities – including participation in formal and informal skills training programs, such as classroom and on-the-job training – play a role in maintaining skills over time. Consistently **using skills at work** also helps sustaining skills as people age.[16] Paccagnella (2016) discovered that older workers who participate in training have higher skill proficiency, but also that they are less likely than younger

workers to participate in training. Common barriers to training participation (among all workers) include being too busy, affordability, family responsibilities, inconvenient scheduling, weak employer support, and lack of prerequisites.[17] Another study finds that those who participate in training tend to have higher skills proficiency to begin with, further complicating a clear story about training and skills.[18]

Skill Use and Skills as Drivers

How are skills used? Where are there gaps?

Cycle 1 research using PIAAC paid limited attention to skill use and skills mismatches, but a few studies uncovered insights relevant to Canada.

- Some studies show Canada ranks above the OECD average in adults' **use of skills at work**, with especially high use of writing and reading skills – and, along with the U.S., the highest use of numeracy skills in the OECD. Use of problem-solving and ICT skills at work by Canadians was also high, but not quite at the level of these other skills.[19]

- Marcolin, Miroudot, and Squicciarini (2016) used PIAAC data on skills used at work to reveal that, across 20 OECD countries, Canada had the lowest proportion of routine-intensive occupations – meaning a large proportion of Canadian jobs involve highly cognitive tasks and require higher skills proficiency. Complementary research found that most jobs in Canada require Level 3 or higher literacy skills, with virtually no jobs left in the Canadian economy that can be performed using only Level 1 skills.[20]

- International studies that included Canada showed that skills mismatches are prevalent and have a significant, negative impact on wages and employment outcomes.[21] Canada is among the countries with the highest levels of over-qualification for jobs and skills mismatches.[22] LaRochelle-Côté and Hango (2016) found that 31 percent of Canadian workers with a university degree reported being overqualified for their job, but also that many of those workers had relatively low literacy and numeracy skills.

- Few studies examined the economic impact of skills mismatches. McGowan and Andrews (2015) examined PIAAC data across 19 countries* and found that skill mismatches are associated with significantly lower labour productivity.

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* Canada was excluded from the regression due to unreliable productivity data.

What are the economic returns to skills?

While more research is needed, especially focused on Canada, some studies using Cycle 1 PIAAC data found that skills contribute to prosperity – both individual and economy-wide.

- A number of studies found that adults with higher information-processing skills earn higher wages than others.[23] A study by Hanushek et al. (2013) of skills and wages across 22 countries found that, in Canada, a one-standard-deviation increase in literacy or numeracy skills is associated with wages that are 19 percent higher among prime-age workers, while higher PS-TRE scores are associated with wages that are 14 percent higher.

- Hanushek et al. (2015) and Lane and Conlon (2016) found that employment and wage returns are higher for numeracy than literacy skills. Lane and Conlon (2016) also found that ICT skills generate the strongest labour market returns, even outstripping the returns associated with higher education – meaning individuals with high ICT skills are more likely to be employed and earn higher wages than those with lower ICT skills regardless of their formal educational attainment.

- Hu, Daley, and Warman (2019) found that the lower skills proficiencies among Indigenous people in Canada are associated with lower labour market participation, higher unemployment, and lower earnings. Broecke (2016) found that skills discrepancies account for a significant share of the earnings gap between individuals across a variety of demographics, including gender, age, race and ethnicity, and immigrant status.

- At the level of the economy, some research using Cycle 1 PIAAC data found that skills generate positive economic returns. Hidalgo-Cabrillana et al. (2017) found that human capital plays a major role in worker productivity with foundational skills – i.e., literacy, numeracy and PS-TRE – playing the largest role. Another study of the relationship between literacy and productivity between 1970 and 2015 across Canada and other OECD countries found that, in the long run, a one percent increase in literacy scores translates into a three percent increase in GDP per capita, and that raising literacy scores among the lowest performing populations would have a greater impact on productivity than improving the literacy of already highly skilled people.[24]

What are the social returns to skills?

PIAAC collected insights on four dimensions of well-being (i.e., trust in others, civic engagement, volunteering, and self-assessed health status) that allowed researchers to investigate the relationships among skills, health and overall well-being.

- OECD Skills Outlooks (2013, 2016) show that literacy skills are correlated with positive individual assessments of health across countries. Borgovoni and Pokropek (2016) also examined the connection between skills and health across 23 countries and discovered a strong positive relationship between literacy skills, interpersonal trust, and self-reported health. And a CMEC (2018) study concluded that Canadians with the highest skills proficiencies report having much better health outcomes.

Changes in Skills Proficiency Among Canada's Adult Population - Cycle 1 to Cycle 2

Two Cycles of PIAAC data have been collected and published, offering insight into how the skills proficiency of Canadian adults have changed – providing a valuable resource for further research. What do the data show about adults' skills have changed in Canada?

Literacy

- **Cycle 1: mean score: 273.5; rank: 10th (at OECD average)**

- **Cycle 2: mean score: 273; rank: 8th (above OECD average)**

- **Change from C1 to C2: ~ -0.525**

Numeracy

- **Cycle 1: mean score: 265.5; rank: 16th (below OECD average)**

- **Cycle 2: mean score: 272.2; rank: 10th (above OECD average)**

- **Change from C1 to C2: ~ +6.726**

PS-TRE/APS

- **Cycle 1 (PS-TRE): 37% of Canadian adults in top 2 skill levels (34% OECD average)**

- **Cycle 2 (APS): 39%of Canadian adults in top 2 skill levels (32%OECD average)**

How have skills dynamics changed between cycles?

While we don't have all the answers yet, the first look at Cycle 2 has given us a window into how different skills dynamics have shifted (or stayed the same) between Cycle 1 and 2.

- **Some skills proficiency gaps present in Cycle 1 continue to persist or expand in Cycle 2.** Canadian men continue to outperform women in numeracy and the literacy gap between young adults with low-educated parents compared to those with highly educated parents widened.[27] On the other hand, the skills gaps between recent immigrants and Canadian-born adults are smaller than they were in cycle 1, although they are still present.[28] Finally, skills proficiencies continue to peak for individuals in their early 30s and steadily decline thereafter.[29]

- **Higher education continues to be associated with higher skills proficiency levels in Canada.**[30] However, across OECD countries increasing rates of education did not compensate for declining skill levels – in fact, skills proficiency among tertiary graduates decreased or stagnated in most countries.[31] This corresponds to Canadian research using Cycle 1 data.[32]

- **Early Cycle 2 analysis confirms the link between skills, employment, and wages** – with numeracy skills continuing to play the most significant role.[33] Cycle 2 analysis also found that information processing skills continue to positively impact interpersonal trust, and self-reported health.[34]

Gaps in Canadian PIAAC Research

Research using Cycle 1 PIAAC data has uncovered important insights, but it remains a critically underused resource. Moreover, it is not clear how much influence the research that was conducted had on Canadian skills policy. St. Clair (2016) notes that "one of the most striking aspects of PIAAC in Canadian policy, especially given the effort and resources put into the development of the surveys, is the relative absence of PIAAC data and framing in the adult literacy scene. Both at provincial and federal level, there are few substantive traces of the work that has been done." Interviews with stakeholders in the skills policy community reinforced this conclusion.

We suggest that the limited attention and use of PIAAC data and related studies might be explained in part by the fact that, taken as a whole, Cycle 1 research did not focus enough on exploring why and how skills matter to productivity, prosperity and well-being. Studies on the economic and social returns to skills – including the magnitude of returns, which kinds of skills matter most, and how exactly skills generate returns – were few and far between. Had more research examined and generated powerful insights about exactly how skills might improve productivity, growth, and social and individual well-being – big challenges for which policy-makers are seeking strategies and solutions – more of them might have taken notice.

Additionally, Cycle 1 PIAAC research did not offer much clarity on how skills policies and programs might be used to address inequities in skills proficiency, nor on how exactly skills can be harnessed to spur productivity and prosperity gains. Research offered much in the way of descriptive statistics, but little in the way of relevance and mechanisms. To be sure, there are limits on the extent to which PIAAC data can be used to inform or evaluate policies and programs at a granular level. Still, some stakeholders felt there were missed opportunities to integrate PIAAC data directly into skills policies and programs themselves and use them as benchmarks to track progress.

With the release of the second cycle of PIAAC data, there is an opportunity to begin filling some of these gaps and taking stock of changes in skills proficiency, use and importance in the economy and society since the first cycle of PIAAC a decade ago. Unfortunately, spurring that research and getting it into the hands of decision-makers will be an uphill climb as the release of Cycle 2 data was offered little fanfare in Canada. Unlike the first cycle, Statistics Canada does not appear to have plans to prepare a substantial report which means that filling research gaps will include doing some of the more descriptive work that provides a base for further studies.

Towards A Canadian PIAAC Research Agenda

With Cycle 2 of PIAAC, we have an opportunity to build on research successes and fill gaps. A comprehensive PIAAC research agenda can enable researchers across the country to collectively address pressing skills-related policy questions to help shape the future skills policy landscape in Canada.

Each of the suggested areas for exploration below was arrived at through an extensive examination of previous PIAAC research, analysis and its outcomes, along with interviews with skills and policy experts across Canada – including both users and non-users of PIAAC. The Canadian PIAAC Research Agenda is organized under three key pillars:

Pillar 1: Research focused on *skills as drivers*

Pillar 2: *Infrastructure and enabling conditions*

Pillar 3: Research focused on *skills as outcomes*

The emphasis in Cycle 2 research should be the "so what" of measured skills. What can we learn about how skills drive outcomes of interest, including productivity, prosperity and well-being? Research that explores levels, trends and distribution of adult skills' proficiency remains important, and the enabling infrastructure and conditions for pursuing research are critical. Still, research on the **impact of skills** should be the priority. This proposed research agenda reflects that priority.

Pillar 1: Skills as Drivers

To better understand, and ensure that policymakers and skills practitioners recognize, the importance of skills for economic, social and individual outcomes, the top priority of a PIAAC research agenda should be skills as drivers. There are numerous themes and questions to pursue within this priority derived from suggestions from interviewees and analysis of gaps in existing research on PIAAC.

Skills, productivity and economic growth. Skills are an important contributor to productivity and economic performance, but what can we learn from PIAAC about the exact nature of that contribution? What can we learn that would help policymakers and practitioners use skills-related policies and strategies to address these key concerns in the Canadian economy more effectively?

- What is the contribution of skills to firm-, sector-, and overall productivity and growth?

- Which skills contribute the most and least to productivity and growth?

- What is the contribution of skills to other economic measures, including firm and sector profitability and export behaviour?

- Are the relevant skills and relationships consistent across sectors?

- How do these relationships vary by occupation, industry, gender, age, race, Indigenous identity, immigration status, region, education, and training?

Skill use and labour market outcomes. Skills proficiency is associated with a range of labour market economies, but what can we learn from PIAAC about the exact nature and strength of those relationships?

- How and which skills are used at work? How does it vary by sector, occupation and firm size?

- How are skills related to labour market outcomes, including employment, wages, job stability, job satisfaction, job responsibilities and other measures?

- How do variations in skills proficiencies affect labour market outcomes?

- How have the relationships – and the minimum skills proficiency needed to succeed – changed over time? What are the employment and income prospects of people with basic or lower levels of skills proficiency now versus ten years ago?

- What is the relationship between skills proficiency and income and wealth inequality?

- How do the relationships among skills, labour market outcomes and inequality vary by occupation, industry, gender, age, race, Indigenous identity, immigration status, region, education and participation in training?

Skills and well-being. Another critical research area for a PIAAC agenda centres on the relationships among skills proficiencies and personal and social well-being–including health, trust, political engagement and efficacy, and volunteerism.

- How are skills proficiencies related to health, trust, political engagement and influence, and volunteerism?

- How do these relationships vary by gender, age, race, Indigenous identity, immigration status, region, and education?

- How are skills proficiencies, individual and social well-being, and labour market outcomes (e.g., employment, wages, inequality) related?

- How have the relationships among skills and measures of individual and social well-being changed over time?

Best practices. While pursuing research under the "skills as drivers" theme, researchers should document how results and relationships compare across jurisdictions – both provincially and internationally. In doing so, the research can identify outliers where skills have particularly strong or weak impacts on specific outcomes and thereby focus attention on understanding what can be learned from high- and low-performing jurisdictions on key concerns.

- Do some jurisdictions see stronger relationships between skills and economic outcomes? What might explain the differences?

- Do some jurisdictions see stronger relationships between skills and labour market outcomes? What might explain the differences?

- Do some jurisdictions see stronger relationships between skills and measures of individual and social well-being? What might explain the differences?

Pillar 2: Infrastructure and Enabling Conditions

In order for a Canadian PIAAC Research Agenda to succeed in generating useful insights, we need to ensure that the data are well-organized, accessible and understandable. Additionally, we should consider ways to organize and incentivize researchers to use the data to answer key questions and develop strategies to disseminate information to relevant audiences and decision-makers across the country.

Data Infrastructure. Reasonable access to well-organized PIAAC data is an essential prerequisite for a Canadian PIAAC Research Agenda. Upon the release of PIAAC cycle 2, Statistics Canada released an overview of some top-level Canadian insights and made some high-level data tables available.[35] The OECD also released several publicly accessible data sets, including an online international data tool, along with country-specific Public Use Microdata Files (PUMFs).[36]

These accessible data sources, particularly the OECD PUMFs, are critical foundations to ensure a wide breadth of individuals, from academics to skills professionals and policymakers, have access to the data for their own uses – including, designing targeted skills policies and programs, evaluating existing policies and programs, writing research papers and reports, and developing new digital applications and tools. ESDC, Statistics Canada and CMEC in partnership with the OECD should work to understand the kinds of data different stakeholders need and continue to fund projects that **organize and make the data available in formats that researchers and other interested parties can use with minimal friction.** By operating through a principle of open and accessible data, we can help to provide the foundation for increased uptake and exploration of a critical source of skills intelligence.

Additionally, efforts should be made to **link PIAAC data to other data sources** – such as Census, tax and other administrative data. While some individual researchers have been successful in making their own connections, a Canadian PIAAC Research Agenda would have much greater success if much of that linking was done in advance and made available to all researchers. The availability of linked data would enable more granular and nuanced analysis, and more relevant policy insights.

Researcher Skills and Training. Recognizing that even accessible, well-formatted and linked data can be difficult for some researchers to navigate – and in light of real, but often overlooked limitations of the data – efforts should be made to provide training to potential researchers who need it. Training should include units on what the data offer, how to use the data (including how to use open and linked data sources), how to interpret findings, and limitations. Seminars and workshops offered by those who have worked with the data in the past – whether from Statistics Canada, the OECD or other organizations – would have substantial practical value.

Community of Practice. The Research Agenda has many candidate questions. Even as we emphasize that the skills as drivers research should take priority, there are decisions to be made about which questions to pursue first, using what methods, and with what aims and audiences. Additionally, there is an abundance of expertise both domestically and internationally that can be tapped by

researchers to improve their research design and execution. A Community of Practice, composed of PIAAC researchers and relevant stakeholders, could be established to address these issues. Additionally, a Community of Practice could help deliver researcher training (as outlined above). Based on interviews for this project, there is strong appetite in Canada and internationally (e.g., at the OECD) to launch such a community.

Call for Papers. To ensure that the Research Agenda is pursued in an organized and intentional way, the Future Skills Centre, in collaboration with the OECD and other partners, should publish periodic calls for papers on pre-selected questions (identified in the Research Agenda and/or by the Community of Practice). Researchers could be invited to submit more detailed proposals and the FSC and its partners could select and fund a suite of projects that would collectively advance the Canadian PIAAC Research Agenda. At the same time, funds could be set aside for original research questions not identified in the Research Agenda or Community of Practice to ensure that creative and important projects are not overlooked.

Publication and Dissemination. Finally, to ensure that the insights generated from the Research Agenda are accessible to decision-makers and contribute to informed and effective skills policy, programs and strategies, key partners should establish an online hub where papers are published; convene conferences and workshops to discuss and disseminate findings to other researchers and practitioners; support the translation of research into more accessible formats for decision-makers (e.g., policy briefings, commentaries and op-eds, presentations); and collaborate on coordinated efforts to brief and advise decision-makers on skills policy.

Pillar 3: Skills as Outcomes

In addition to carefully examining and communicating the role of skills in economic and social outcomes, a Canadian PIAAC Research Agenda should include some examination of skills as outcome. Research along these lines was prominent in Cycle 1, so the emphasis here should be on updating our knowledge and digging deeper on explanations for variation. Three core questions should guide research in this theme: How do Canadian adults perform on skills? What explains Canadian adults' skills proficiency? How can we improve?

How do Canadian adults perform on skills?
Research to address this question should be relatively straightforward in Cycle 2 as it aligns with the approach taken on much of the research conducted on Cycle 1 data. While it is largely a matter of examining and reporting descriptive statistics, Cycle 2 PIAAC offers an opportunity to update those descriptions, spot changes, and identity jurisdictions that perform especially well (or poorly) and thereby could serve as candidates for best practice assessment.

- How do Canadian adults perform on skills in PIAAC Cycle 2?

- How does Canada compare to international peers?

- How does skills proficiency vary by gender, age, race, Indigenous identity, immigration status, region, and education?

- What has changed since Cycle 1?

What explains Canadian adults' skills proficiency?
The design of effective skills policies, programs and strategies depends on a clear understanding of the mechanisms by which skills are developed, retained and lost. Some attention should be given to unpacking these issues in the research agenda and could proceed along a few related lines:

Skills and demographics

- How do different populations in Canada perform on skills (e.g., gender, age, race, Indigenous identity, immigration status, region?)

- Which populations perform especially well or especially poorly?

- How has subpopulation-level performance changed over time?

Education and training

- What is the relationship between education and skills (e.g., years of education, institution type, fields of study)?

- Has the relationship between education and skills changed over time?

- What is the relationship between training and skills? Who receives training, what type, and what impact does it have?

- How do relationships among skills, education and training vary by occupation, industry, gender, age, race, Indigenous identity, immigration status and region?

How can we improve Canada's adult skills performance? With research on why skills matter, who has them, and how they are acquired in hand, the research agenda could include studies that examine potential policy, program and strategy interventions to improve skills.

- What can we learn from jurisdictions that perform well and/or saw improvements in skills (in general or among subpopulations) over the past 10 years?

  » What role does education play in those jurisdictions?

  » What role does training play in those jurisdictions?

  » How do other jurisdictions' strengths align with occupation or industrial structure?

  » How do other jurisdictions' strengths align with (sub)population composition?

- How can insights and practices be adapted to the Canadian context?

Sequencing the Canadian PIAAC Research Agenda

Successful execution of the Canadian PIAAC Research Agenda requires a strategic sequencing of activities. At the highest level, we recommend an initial, concurrent focus on pillars one (skills as drivers) and two (infrastructure and enabling conditions), followed by the pillar three (skills as outcomes).

- To maximize interest in and best use of PIAAC data while it is still fresh, we suggest that some initial studies under Pillar 1 (Skills as Drivers) should be launched very soon. Insights from this kind of research should illustrate to policymakers, skills practitioners and others **why skills matter to productivity, prosperity and well-being** – and thereby generate the attention needed to further support and pursue the Canadian PIAAC Research Agenda.

- At the same time, efforts under Pillar 2 (Infrastructure and Enabling Conditions) should be launched to ensure that the data are accessible and well-organized for users, and potential users are trained to launch additional studies. Ideally, these efforts are completed within 12 to 18 months so that researchers can launch additional studies while the data are still current

- After work on the first two pillars is well established, efforts on the third pillar (Skills as Outcomes) should begin. Once the case for the value of skills has been explored (Pillar 1), research focused on skills as outcomes (Pillar 3) will help provide a nuanced understanding of the distribution of skills and how they are being developed across Canada. This can serve to inform appropriate policy and programmatic responses to improve Canada's skills landscape.

By identifying a potential strategic rollout of the Canadian PIAAC Research Agenda, key stakeholders can prioritize the kinds of research and activities they choose to fund and engage with over the short-, medium- and long-term. Researchers already pursuing valuable projects that do not align with this recommended sequence should not be discouraged from doing so. Rather, this proposed implementation strategy and timeline should serve as a guiding framework to help stakeholders prioritize new projects and plan for many years of fruitful PIAAC research and engagement.

Skills For Productivity, Prosperity & Well-Being

PIAAC is an essential resource that could help Canada generate better strategies to improve productivity, prosperity and well-being.

With the release of new data, Canada has a once-in-a-decade opportunity to design and execute a research agenda that can fill knowledge gaps, identify exactly why and how skills matter to economic and social outcomes, and help shape policies and programs to improve Canada's performance.

For that to happen, Canada needs to engineer a shift in the kinds of research that is done using PIAAC and encourage policymakers, practitioners and others to move past horse-race examinations of the results to see its potential to support better policies, programs and strategies to spur productivity, prosperity and well-being. If Canada is to effectively address its major productivity and growth challenges, we will need a better understanding of exactly how skills play a role and how they can help drive improvements.The Canadian PIAAC Research Agenda articulated here offers an important step towards those making those shifts.

Endnotes

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Appendix A: PIAAC Components

TABLE 1
PIAAC Skills Use Examples

Task Cluster	Activities
Information Processing	
Reading	Read directions or instructions; letters, memos or emails; articles in newspapers, magazines or newsletters; articles in professional journals or scholarly publications; books; reference manuals or materials; bills, invoices, bank statements or financial statements; diagrams, maps, schematics.
Writing	Write letters, memos or emails; articles for newspapers, magazines or newsletters; reports; fill in forms.
Numeracy	Calculate prices, costs or budgets; use or calculate fractions, decimals or percentages; use a calculator (hand held or computer-based); prepare charts, graphs or tables; use simple algebra or formulas; use advanced maths or statistics.
Problem solving	Solve simple problems; solve complex problems
Technology	
ICT skills	Use computers; email; Internet for information or monetary transactions; spreadsheets; word processing; write or prepare computer code; real-time discussions using Internet; overall level of computer use in terms of complexity.
Interaction	
Cooperation	Time spent collaborating; sharing of information with co-workers.
Influencing	Selling products or services; making speeches or presentations; advising; persuading or influencing others; negotiating; instructing, training or teaching others.
Learning	
Learning	Learning from others; learning by doing; keep up to date with new products, services.
Organization	
Organization and planning	Planning own activities; planning activities of others; organising own time.
Physical	
Physical requirements	Working physically for long periods; use of fine motor skills.

TABLE 2
PIAAC Background Questions

Domain	Question Coverage
Demographics	
Demographics	Age, gender, country of birth
Household and family structure	Number of persons in household, spouse/partner, activity of spouse/partner, number and age of children
Language	First and second language as child; language(s) spoken at home
Immigration	Immigration status, country of birth of parents, age of immigration
Social background	Education of parents, number of books in home at 16
Residential background	Location of residence
Education and Skills Training	
Education	Highest education, country, field, age of completion
Current study	Undertaking formal course, level and field of study
Incomplete study	Started but not complete formal course, level/field of course, age at start
Formal studies in previous years	Undertaken formal studies in previous year, how many courses, level of last course, reason for undertaking study, employed while studying, study took place in or outside working hours, usefulness of course to work, type of employer support received.
Non-formal studies past 12-months	Undertaken different non-formal learning activities in previous 12 months (open or distance courses, organised on-the-job training, seminars or workshops, other courses), how many activities of each type.
Most recent non-formal activity	Type of activity, activity mainly job-related, main reason for participation, took place in or outside working hours, employer support provided.
Participation in education & training, past 12 months	Total time in education and training, proportion of time in job-related activities.
Barriers to education and training	Wanted to participate in learning activities in the prior 12 months but did not, reasons preventing participation.
Learning style	Interest in learning, approach to new information.
Labour Force Status and Income	
Labour force status	Employed, self-employed, unemployed in the past 12 months; total time in employment; number of employers in the past five years; type of employment contract; usual working hours; main reason for leaving job
Occupation	Occupation (International Standard Classification of Occupations (ISCO))
Industry	Specific industry (classification codes)

Income	Gross wages or salary in the past 12 months
Firm	Establishment size; number of employees (if self-employed); number of employees increasing or decreasing; part of larger organization
Work	Management of supervisory responsibilities; number of subordinates; extent of flexibility regarding job tasks; job satisfaction
Social Participation and Health	
Trust	Trust in others; perception of others behaviour towards self
Political efficacy	Influence on political process
Volunteering	Frequency of voluntary work in previous 12 months
Health status	Self-assessed health status

Appendix B: Interviewees

Interviewee	Organization
Karen Myers Mark McKerrow Max Palamar	Blueprint
Michael Burt	Conference Board of Canada
Scott Murray	DataAngel
Glenda Quintini	OECD
Bruno Rainville	Employment and Social Development Canada (ESDC)
Jennifer Robson	Carleton University
Tammy Schirle	Wilfrid Laurier University
Marc Frenette	Statistics Canada
Alex Usher	Higher Education Strategy Associates
David Gyarmati	The Social Research and Demonstration Corporation (SRDC)
Katerina Sukovski	Council of Ministers of Education (CMEC)
Wendy Cukier	Diversity Institute