

The Effect of Literacy  
and Essential Skills on  
**Labour Market  
Outcomes for  
Canadian Workers**

A SUMMARY REPORT



Canadian Apprenticeship Forum  
Forum canadien sur l'apprentissage



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# Literacy and Essential Skills

## About CAF-FCA

The Canadian Apprenticeship Forum-Forum canadien sur l'apprentissage (CAF-FCA) is a national, not-for-profit organization working with stakeholders in all regions of Canada. We influence pan-Canadian apprenticeship strategies through research, discussion and collaboration – sharing insights across trades, across sectors and across the country – to promote apprenticeship as an effective model for training and education. Our Board of Directors is comprised of representatives of business, labour, the jurisdictional apprenticeship authorities, education and equity-seeking groups. Through our work, CAF-FCA has shed light on a number of key issues affecting apprenticeship, such as the perceived barriers to accessing and completing apprenticeship and the business case for apprenticeship training.

For more information, visit the CAF-FCA website at [www.caf-fca.org](http://www.caf-fca.org).

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This project is funded by the Government of Canada's Adult Learning Literacy and Essential Skills Program (ALLESP).

The opinions and interpretations in this publication are those of the author and do not necessarily reflect those of the Government of Canada.

Funded by the Government of Canada's  
Adult Learning Literacy and Essential Skills Program (ALLESP)

Canada

## 1.0 Introduction

This summary research report<sup>1</sup> explores the value of literacy and essential skills (LES) for workers and better quantifies the benefits of training. LES as a related and causal factor for higher wages in the labour market is investigated. Results for the general population are examined, in addition to sub-groups such as journeypersons, Aboriginal peoples, immigrants and persons with disabilities. Results are drawn from the Programme for the International Assessment of Adult Competencies (PIAAC), the 2006 census and various versions of the National Graduate Survey (NGS). Across all three data sets, the research highlights earnings outcomes as the main labour market benefit of LES. These positive research findings contribute to an evidence-based body of knowledge about the importance of LES and will inform future workplace training policies and outreach about the business case for LES training.

## 2.0 Relevance

Significant knowledge gaps are addressed through this detailed research:

- Prior to this work, the apprenticeship community had anecdotal insights about the value of essential skills, but limited evidence on the links between skills and labour market outcomes. Apprenticeship stakeholders wondered about the tangible benefits for workers who invest time and money in improving their LES. Does it yield returns in the labour market? Can LES be isolated as the causal factor or is it other factors that truly make a difference? This analysis examines related factors (the PIAAC and NGS analysis), and, when possible, causation (the census analysis).
- In general, tradespeople do not receive access to as much training as other occupational groups and their experiences tend to be overlooked in the literature.<sup>2</sup> The availability of substantial and recently released data sets, such as PIAAC, provided the opportunity to understand tradespeople's skill levels and labour market experiences. Understanding the value of LES for tradespeople focuses attention on this group of workers, justifies investments in LES and builds the business case for training.

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1 Extensive background documentation with further detailed analysis is available upon request from CAF-FCA by emailing [info@caf-fca.org](mailto:info@caf-fca.org).

2 See Statistics Canada, "Skills in Canada: First Results from the Programme for the International Assessment of Adult Competencies (PIAAC)," (Ottawa: Tourism and the Centre for Education Statistics Division, 2013), 38. Training tends to be focused on upper-level managers rather than the majority of employees. Those with college or university degrees or who are managers or professionals are more likely to receive training than other types of workers. Industry Canada, "What Are Companies Doing to Train Employees?" Canadian Training Solutions. Those in the trades received approximately 24 hours of formal learning, less than that received by professional, technical and supervisory staff. The Conference Board of Canada, "Learning and Development Outlook Are We Learning Enough?" Learning and Development Outlook, 2007, 18-20.



- These findings also support the business case for training among apprentices. Although apprentices are often reluctant to pursue additional schooling because they prefer “hands-on” learning, they may seek upgrading when they realize there are financial benefits of doing so. Improved LES among apprentices may lead to better completion and certification examination pass rates, contributing to the development of a highly skilled workforce.
- Understanding the value of LES for underrepresented groups, as examined in this report, may help policymakers and practitioners create more effective and targeted workplace training programs. Underrepresented groups stand to benefit as well. Those who learn about the business case and are motivated to participate in LES training have the potential to earn higher wages. Increasing income for vulnerable groups stands to address inequalities.
- This research is valuable for policymakers who require proof that dollars directed to LES training are well-invested.

## 3.0 Key Takeaways

Drawing upon the research findings, these key takeaways will benefit apprenticeship stakeholders interested in helping apprentices, tradespeople and underrepresented groups improve their labour market outcomes. Future action, programs and policies related to workplace training will also benefit from these observations:

- The research indicates that all workers benefit from improved LES, highlighting the importance of LES training that is accessible and affordable for all.
- The direct link between LES and wages may motivate workers to participate in LES programs because there is a tangible financial benefit. The business case for LES training should be promoted to workers so they understand the benefits and can seek out additional training and upgrading.
- Employers clearly value LES in their employees since better LES yields higher wages in the labour market. An ongoing commitment to LES will support employers seeking a highly skilled labour force to address skills shortages and technological change. For educators and workplace trainers, LES should remain an important part of training content and curriculum to meet employer needs.
- The analysis of the target groups revealed that investments in LES are worthwhile for underrepresented groups. The higher wages earned through better LES could have a significant societal and personal impact. Reduced reliance on government supports could save governments significant monies. Receiving an income also builds self-esteem and breaks the cycle of poverty.
- Skills such as literacy, numeracy and problem-solving are interrelated and vary in importance, so it is difficult to identify the value of individual skills. This examination suggests that although literacy is important, numeracy skills may be more closely associated with higher wages. Future research may provide further insights about the value of specific essential skills.
- There is considerable diversity in the results across the groups examined. The best combination of skills differs considerably for each group, likely reflecting different needs and situations. A “one-size-fits-all” solution for improving LES is inappropriate.
- The data mixes trade qualifiers and apprentices, so it is difficult to distinguish the impact of LES on apprentices specifically. There is a need for better longitudinal data on apprentices to analyze apprentice skills development and the links between LES and completion.

- A detailed analysis of sector realities, such as turnover in resource development jobs, and a study of older workers who have more career stability, would help further explain factors that impair LES development among Aboriginal peoples.
- Career awareness outreach needs to emphasize the importance of LES and lifelong learning to youth and parents.

## 4.0 Sources

The report draws upon three distinct data sources: PIAAC, the 2006 census and the NGS. The researchers looked at the impact of multiple essential skills and then attempted to analyze the importance of individual skills. They also examined the overall population and specific target groups. The use of the different data sets has a number of advantages. Together, they provide information on a wider range of target groups, more earning outcome measures than available in any one data set and multiple lines of evidence to verify the robustness of the results. For this study, the PIAAC data on LES was merged into the NGS and the census. The samples in the three data sources were not large enough to do a sector- or trade-specific analysis.

### **Programme for the International Assessment of Adult Competencies:**

PIAAC is a survey conducted by the Organization of Economic Cooperation and Development (OECD) to assess key cognitive and workplace skills. PIAAC directly assesses cognitive skills in the areas of literacy, numeracy and problem-solving in technology-rich environments. Findings from PIAAC help describe the relationship between the cognitive domains assessed and a number of key indicators, including demographic characteristics, educational attainment, employment status and skills used at work and at home. This data source enabled the researchers to analyze the effect of different aspects of LES on hourly wages. In addition to data on the overall population, PIAAC enabled a separate analysis of three target groups: Aboriginal persons, immigrants and journeypersons. The latest data was released in 2013.

### **PIAAC DEFINITIONS**

**Literacy** is defined as “understanding, evaluating, using and engaging with written texts to participate in society, to achieve one’s goals and to develop one’s knowledge and potential.”

**Numeracy** refers to “the ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life.”

**Problem-solving** in technology-rich environments means “using digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks.”

Source: OCED, “Main Elements of the Survey,” PIAAC  
See: <http://www.oecd.org/site/piaac/mainelementsofthesurveyofadultskills.htm>.



**2006 Census:**

The census provides demographic and statistical data on the Canadian population. A mandatory longitudinal national census was conducted every five years by Statistics Canada, until 2006. The traditional census was then replaced by the voluntary National Household Survey. The detailed information in the census allowed for an analysis using weekly earnings as the outcome measure. Hourly wage data was not available. The census has a much larger sample than the PIAAC data. This larger sample set is important for the subgroup analysis. The census contains separate information not only for Aboriginal persons, immigrants and journey persons, but also for persons with disabilities, who are not analyzed separately in the PIAAC data. Unlike PIAAC, the census also contains information on year and province of birth. This additional information enabled the researchers to use a procedure to better estimate the extent to which LES causes increases to earnings, rather than simply being associated with them.

**National Graduate Survey:**

This survey, implemented by Statistics Canada, was designed to determine such factors as:

- the extent to which graduates of postsecondary programs were successful in obtaining employment since graduation
- the relationship between the graduate's program of study and the employment subsequently obtained
- the graduate's job and career satisfaction
- the rates of under-employment and unemployment
- the type of employment obtained related to career expectations
- qualification requirements and the influence of postsecondary education on occupational achievement

The NGS is restricted to individuals who have graduated from different post-secondary programs, including professional and trades programs. The NGS has information for the various target groups, but not always for all years. The earnings outcome measure is based on annual earnings. The NGS also has a longitudinal dimension since it connects with respondents two years and five years after their graduation. It provides information on the same individuals for 1992 and 1995, for 1997 and 2000, for 2002 and 2005 and for 2007. Data for 2010 is not available. This longitudinal aspect of the two and five year follow-ups allowed the researchers to determine whether the effect on earnings persists between two and five years after graduation. An examination of dynamics, like the link between LES and higher earnings growth and whether the effects of the skills appreciate or depreciate over time, were possible based on the longitudinal component in the NGS.

## CHARACTERISTICS OF SOURCES

### **PIAAC:**

2013 data (smaller sample set than census) on hourly earnings and skills assessments for the general population and for Aboriginal persons, immigrants and journeypersons

### **Census:**

A large 2006 sample containing longitudinal data on weekly earnings for the general population and Aboriginal persons, immigrants, journeypersons and persons with disabilities

### **NGS:**

Longitudinal data on annual earnings for post-secondary graduates for various years ranging from 1992 to 2007



## 5.0 Methodology

### Approaches

The methodology used to analyze the three data sets is similar. Regression analysis was applied to estimate the independent effect of different measures of LES on earnings outcomes after controlling for the effect of other factors that affect earnings. The regression analysis provides coefficient estimates that indicate the percentage effect on the earnings of individuals that result from a one-unit change in each of the variables, including the LES measures. The procedure, called instrumental variable (IV) analysis, deals with the concern that conventional ordinary-least-squares (OLS) regression analysis provides estimates of association or correlation and not necessarily causation. IV estimates are designed to provide exogenous variation in LES. They deal with the possible selection problem that arises if individuals with higher LES also have other unobserved factors that contribute to higher earnings, such as motivation, innate ability and organizational skills.

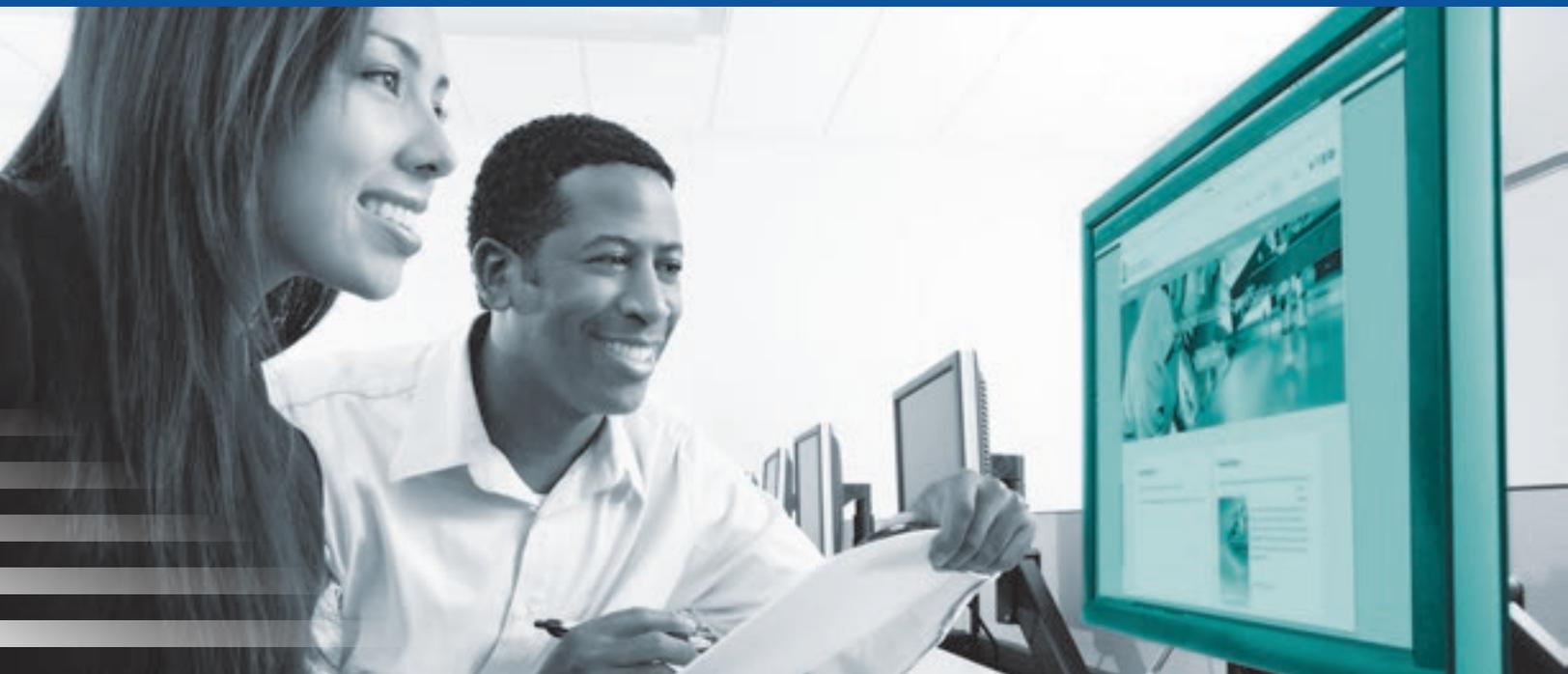
### TYPES OF ANALYSIS

#### **Ordinary-Least-Squares (OLS) Regression Analysis:**

This modelling technique is used in economics to illustrate associative relationships between different variables. This approach was used when completing the PIAAC and NGS analyses.

#### **Instrumental Variable (IV) Analysis:**

The large sample set and detailed information in the census allowed for an IV analysis. This type of analysis indicates causation between variables as opposed to a relationship.



## Target Groups

Analysis was conducted for four different target groups. Target groups were chosen based on whether sufficient data was available and the extent to which each group faces labour market challenges. Each group has the potential to offer a solution to skills shortages.

- Apprentices and tradespeople are of interest due to pressing labour market challenges associated with skills shortages in the trades, youth unemployment and delayed school-to-work transitions.
- Aboriginal people, immigrants and persons with disabilities generally face high unemployment, despite employer demand for workers.
- Aboriginal people have high dropout rates from secondary school and a high birthrate. The combination of these factors may impair the strength of the future workforce, resulting in Aboriginal youth who do not have the appropriate background to pursue post-secondary education.
- Immigrants struggle to integrate into the labour market, despite generally high levels of education.

There is a growing recognition that underrepresented groups can be a valuable source of labour to address skill shortages. Employment for these groups could provide an important source of social interaction, as well as income that would reduce dependency on government-funded income support.

## DEFINING JOURNEYPEOPLE

The census has information on journeypeople, but does not distinguish between the distinct pathways to certification. All the people who received a Certificate of Qualification as their highest degree/certificate are included in the data as a one group. The definition includes individuals who completed their apprenticeship requirements and may have obtained their Certificate of Apprenticeship (C of A). It also includes trade qualifiers who “challenged” the certification exam based on sufficient experience in the trade, without having done an apprenticeship. As a result of this data limitation, the specific experiences of apprentices cannot be analyzed.

## Skills Analyzed

Three different LES measures are used from the PIAAC data. The first are eight self-reported skills:

- reading
- writing
- document use
- numeracy
- information communications technology (ICT)
- planning
- learning
- influencing



The second set of LES measures are based on two psychometric tests used to test the cognitive skills of literacy, including reading components and numeracy for all persons.

The third set of LES measures are based on three psychometric tests for those who signalled their computer competence by taking their psychometric test on a computer. Those respondents were tested not only for their cognitive skills of literacy and numeracy, but also their problem-solving skills.

Each of these separate sets of LES measures were also combined into an index that is a sum measure of the various skills.

*Psychometric tests  
are a standard and  
scientific method used  
to measure individual  
mental capabilities and  
behavioural styles.*

References throughout the report to **all three indexes of LES** includes:

- eight self-reported skills
- two psychometric test skills of literacy and numeracy for all persons
- three test skills to include problem-solving in technologically rich environments

There appears to be insufficient variation across the eight separate self-reported skills to identify their independent impact. This is especially the case when evaluating the target groups, where the sample sizes are smaller. The estimates are often statistically insignificant and seldom exhibit a clear pattern. This is also the case to a lesser extent for the literacy, numeracy and problem-solving psychometric test scores. As such, the researchers do not report the coefficient estimates for the eight separate self-reported skills so they can focus on the researcher-preferred estimates which involve aggregate indexes. The dependent variables are coded in logarithmic form so as to provide a convenient interpretation of the coefficient estimates. These represent the percent the earnings outcome measure would change in response to a one-unit increase in LES measurement.

For additional detail on the methodology and results, readers may refer to the extensive background documentation on each of the sources. This background documentation includes separate reports on the PIAAC, census and NGS.<sup>3</sup>

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3 Email [info@caf-fca.org](mailto:info@caf-fca.org) to obtain these reports

## 6.0 Summary Results for PIAAC Data

The results from the PIAAC indicate that LES is linked to higher wages. Table 1 provides the coefficient estimates from the PIAAC data, indicating the percentage change in earnings associated with a one unit change in each LES measure. The gross relationship between wages and the index of eight self-reported LES skills (before controlling for the effect of other variables that can affect wages) is generally positive and very strong (Table 1, column 1). Much of this, however, reflects the fact that LES skills are correlated with factors that positively affect wages such as education and computer use. When these other factors are controlled for (Table 1, column 2), the relationship between wages and LES remains positive, but smaller in magnitude.

The psychometric test scores of both literacy and numeracy are associated with wages that are substantially higher after controlling for the effect of other factors. The effect of numeracy is generally larger than that of literacy, highlighting the importance of numeracy skills in the information economy. This applies to all persons and not just to those who are computer-competent, emphasizing that numeracy skills are important in all workplaces and not only those where computers are prevalent. Surprisingly, problem-solving skills for those who are computer-competent have no effect on earnings, perhaps reflecting the possibility that computer skills often involve the application of menu-driven routine tasks and are a substitute for problem-solving skills.

There is considerable diversity in the results across the three target groups. For all three target groups, the overall index of eight self-reported skills is significantly associated with higher wages, except for those who have completed a trades certificate, where the relationship is marginally insignificant. The best combination of skills differs considerably, likely reflecting different needs and situations.

### UNDERSTANDING TABLES IN THIS REPORT

The meaning and significance of the panels and columns in the tables throughout the report are outlined below:

- Top Panel: Provides the effect of the index of the sum of eight self-reported skills
- Second Panel: Reveals the effect of the literacy and numeracy psychometric test scores and the index of their sum
- Third Panel: Indicates the effect of the literacy, numeracy and problem-solving psychometric test skills and the index of their sum for those who are computer literate
- First Column: Outlines the effect for the LES before controlling for the effect of other factors that can affect earnings
- Second Column: Shows the net effect of the LES after controlling for the effect of other factors that can affect earnings
- Third Column: Signifies the net effect for the non-target groups
- Fourth, Fifth and Sixth Columns: Provides the net effect for the different target groups



**Table 1:**  
**OLS Regressions for Ln<sup>4</sup> Hourly Wages, PIAAC Data**

VARIABLE	LES only (1)	+ Controls (2)	Non-target (3)	Immigrant (4)	Aboriginal (5)	Journeyperson (6)
<b>8 SELF-REPORTED LES SKILLS</b>						
Index of 8 LES Skills	0.031 ***	0.016 ***	0.016 ***	0.014 ***	0.012 ***	0.014
<b>2 PSYCHOMETRIC SKILLS FOR ALL PERSONS</b>						
PIAAC Literacy/10	0.009 ***	0.006 **	0.001	0.016 ***	-0.010	-0.011
PIAAC Numeracy/10	0.025 ***	0.013 ***	0.013 ***	0.012 ***	0.022 ***	0.020 **
Index of 2 Psychometric Skills	0.017 ***	0.010 ***	0.008 ***	0.014 ***	0.007 ***	0.005
<b>3 PSYCHOMETRIC SKILLS FOR SUBSAMPLE OF COMPUTER-COMPETENT</b>						
PIAAC Literacy/10	0.026 ***	0.005 *	0.001	0.017 ***	-0.013	0.002
PIAAC Numeracy/10	0.030 ***	0.012 ***	0.013 ***	0.009 **	0.015 **	0.020 **
PIAAC Problem-solving/10	-0.027 ***	0.002	0.002	0.003	0.009	-0.019
Index of 3 Psychometric Skills	0.011 ***	0.006 ***	0.005 ***	0.010 ***	0.004 ***	0.002

Source : Tables 2A, 3A, 4A of the report based on PIAAC data. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

4 "Ln" stands for "natural logarithm." It is a common transformation of variables used in regression work, since it allows for the interpretation in the coefficients as percentage changes in wages. For instance, a coefficient of 0.1 on a coefficient like education would imply that a one-year increase in educational attainment would increase earnings by 10 per cent (or 0.1 in decimal form).

Table 2 provides a more visual summary portrayal of the relationship of Table 1, restricting the analysis to the net effects for all persons and for the three target groups. Clearly, the significant positive effects dominate.

**Table 2:**  
**Visual Portrayal of Relationship between Wages and Various LES Measures, All Persons and 3 Target Groups, PIAAC Data**

VARIABLE	All Persons (1)	Immigrant (2)	Aboriginal (3)	Journey person (4)
<b>8 SELF-REPORTED LES SKILLS</b>				
Index of 8 LES Skills	↑	↑	↑	INSIG.
<b>2 PSYCHOMETRIC SKILLS FOR ALL PERSONS</b>				
PIAAC Literacy/10	↑	↑	INSIG.	INSIG.
PIAAC Numeracy/10	↑	↑	↑	↑
Index of 2 Psychometric Skills	↑	↑	↑	INSIG.
<b>3 PSYCHOMETRIC SKILLS FOR SUBSAMPLE OF COMPUTER COMPETENT</b>				
PIAAC Literacy/10	↑	↑	INSIG.	INSIG.
PIAAC Numeracy/10	↑	↑	↑	↑
PIAAC Problem-solving/10	↓	INSIG.	INSIG.	INSIG.
Index of 3 Psychometric Skills	↑	↑	↑	INSIG.

**Symbols**



LES measure has a positive and statistically significant effect on earnings



LES measure has a negative and statistically significant effect on earnings

**INSIG.** denotes a statistically insignificant effect on earnings

Source: Columns 2, 4, 5 and 6 respectively of Table 1.



## 7.0 Summary Results for Census Data

Although the PIAAC findings showed positive relationships between wages and LES, the sample size was relatively small. The census analysis allowed for further testing with a larger sample, enabling the researchers to use the preferred IV procedure to better estimate the extent to which LES causes increases in earnings, rather than simply being associated with higher earnings. The researchers incorporated the PIAAC results into the census information when doing this analysis. Table 3 summarizes the preferred estimates based on the 2006 census data. Table 4 provides a more stark visual portrayal of those relationships. The generalizations below relate to those estimates, but also to some of the more detailed estimates contained in the background information (see Census Report).

The effect of the index sum of all eight of the self-reported skills is positive, statistically significant and quantitatively large for all groups. The preferred estimates indicate that every standard deviation increase in the LES index for all persons is associated with a 16 per cent increase in their weekly earnings, implying an increase of \$112 from the average of \$702 to \$814. The effects are slightly smaller for each of the four target groups: 13.6 per cent for persons with disabilities, 13.2 per cent for Aboriginal persons, 11.9 per cent for journeypersons and 9.3 per cent for immigrants. Nevertheless, the impacts are substantial and highlight the potential for LES to enhance the earnings of all persons, including the target groups.

Estimates for the index of the sum of the literacy and numeracy psychometric test scores are also positive and statistically significant for all groups, except for Aboriginal persons where they are statistically insignificant. The coefficient of 0.161 for all persons indicates that every point increase in their combined literacy and numeracy score results in a 16.1 per cent increase in their earnings.

With respect to the separate components of the two psychometric tests, the effects of literacy skills are positive for all persons, journeypersons and persons with disabilities and they are insignificant for immigrants and Aboriginal persons. For all persons, every one point increase in their literacy score gives rise to a 15.1 per cent increase in their earnings. The numeracy test score has a positive and significant effect only for immigrants and persons with disabilities. It is statistically insignificant for all other groups.

For the subsample of those who are computer-competent, estimates for the index of the sum of all three psychometric test skills are positive, statistically significant and large for all groups, except Aboriginal persons where it is zero. The coefficient of 0.097 for the overall index for all persons indicates that every point increase in their combined literacy, numeracy and problem-solving score gives rise to a 9.7 per cent increase in the earnings of those who are computer-competent. The estimates of the effect of the three separate components were unstable and, therefore, not reported.<sup>5</sup>

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5 See the background documentation for more information.

The three indexes for the various LES measures show positive, statistically significant and large effects on earnings. The exception is for Aboriginal persons where the indexes for the two and three psychometric test skills are statistically insignificant.

The magnitude of the effects for the indexes are by far the largest for journeypersons for the two psychometric test skills for all persons and the three psychometric test skills for those who are computer-competent. These findings suggest that the insignificant effects for journeypersons often found in the PIAAC data may reflect other unobserved characteristics that negatively affect earnings and are not controlled for in PIAAC. Using the census data, when these factors are controlled for through the IV procedure, LES has an extremely large effect on the earnings of journeypersons.

Similar to PIAAC, the census illustrates that there is considerable diversity in the importance of the different skills across different groups and customized solutions are required.

**Table 3:  
Preferred Regressions for Ln Weekly Earnings, 2006 Census**

	All Persons (1)	Non-Target (2)	Immigrant (3)	Aboriginal (4)	Journeyperson (5)	PWD <sup>6</sup> (6)
<b>8 SELF-REPORTED LES INDEX (IV ESTIMATES, TABLE 9 OF CENSUS REPORT)</b>						
Index (8)	0.160 ***	0.184 ***	0.093 ***	0.132 ***	0.119 ***	0.136 ***
<b>2 PSYCHOMETRIC TESTS FOR ALL PERSONS (IV ESTIMATES, TABLE 9 OF CENSUS REPORT)</b>						
PIAAC Literacy/10	0.151 ***	0.164 ***	0.061	-0.165	0.507 ***	0.097 **
PIAAC Numeracy/10	0.191	0.130	0.512 ***	0.260	-0.083	0.256 *
Index (2)	0.161 ***	0.156 ***	0.161 ***	-0.010	0.398 ***	0.138 ***
<b>3 PSYCHOMETRIC TESTS FOR COMPUTER-COMPETENT (IV ESTIMATES, TABLE 9 OF CENSUS REPORT)</b>						
Index (3)	0.097 ***	0.094 ***	0.086 ***	-0.000	0.238 ***	0.084 ***

Source: Table 9 of the report based on census data \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

6 PWD means persons with disabilities



Table 4 provides a visual portrayal of the relationships in Table 3, restricting the analysis to the net effects for all persons, for the non-target group and for the four target groups available in the census data.

The dominance of the  symbol denotes that the LES measure has a positive and statistically significant effect on earnings for all three indexes for the various LES measures. The exception is for Aboriginal persons where the indexes for the two and three psychometric test skills are statistically insignificant.

**Table 4:**  
**Visual Portrayal of Relationship between LES and Weekly Earnings, 2006 Census**

	All Persons (1)	Non-Target (2)	Immigrant (3)	Aboriginal (4)	Journey person (5)	PWD (6)
<b>8 SELF-REPORTED LES INDEX (IV TABLE 9, PANEL 1)</b>						
Index (8)						
<b>2 PSYCHOMETRIC TESTS FOR ALL PERSONS (IV TABLE 9, PANEL 2)</b>						
PIAAC Literacy/10			INSIG.	INSIG.		
PIAAC Numeracy/10	INSIG.	INSIG.		INSIG.	INSIG.	
Index (2)				INSIG.		
<b>3 PSYCHOMETRIC TESTS FOR COMPUTER-COMPETENT (IV TABLE 9, PANEL 3)</b>						
Index (3)				INSIG.		

**Symbols**



LES measure has a positive and statistically significant effect on earnings



LES measure has a negative and statistically significant effect on earnings

**INSIG.** denotes a statistically insignificant effect on earnings

Source: Table 3.

## 8.0 Summary Results for NGS Data

The NGS provided a further opportunity to test the validity of the findings. Table 5 provides a summary of the relationship between various aspects of LES and the earnings for all persons based on the specification, when all control variables are included, except education. It may be inappropriate to net out the effect of education to the extent that LES fosters increased education which has a generally positive effect on earnings.

The effect on earnings of the three indexes of LES is positive and statistically significant. The magnitude of the effects are also very large. For example, the magnitude for the eight self-reported skills averages about 0.135, indicating that a standard deviation in the self-reported skills is associated with a 13.5 per cent increase in earnings. The changes between two and five years after graduation for all three of the indexes of LES are positive and statistically significant, highlighting that the positive effect tends to grow or appreciate, at least over the three-year period of time.

**Table 5:**  
**OLS Regressions for Ln Annual Earnings, All Persons, Various NGS Cohorts**

	1990 Cohort			1995 Cohort			2000 Cohort			2005 Cohort
	1992 (1)	1995 (2)	95-92 (3)	1997 (4)	2000 (5)	00-97 (6)	2002 (7)	2005 (8)	05-02 (9)	2007 (10)
<b>8 SELF-REPORTED MEASURES</b>										
Index (8 Self-Reports)	0.123 ***	0.121 ***	0.008 **	0.133 ***	0.140 ***	0.018 ***	0.137 ***	0.149 ***	0.022 ***	0.142 ***
<b>2 PSYCHOMETRIC TESTS FOR ALL PERSONS</b>										
PIAAC Literacy	0.084 ***	-0.013	-0.055 ***	-0.011	0.001	0.055 **	0.077 *	0.067 **	0.039	0.126 ***
PIAAC Numeracy	0.015	0.113 ***	0.059 ***	0.105 ***	0.115 ***	-0.029	0.041	0.073 **	-0.011	-0.005
Index (Two Tests)	0.049 ***	0.052 ***	0.004 ***	0.048 ***	0.060 ***	0.012 ***	0.058 ***	0.070 ***	0.013 ***	0.058 ***
<b>3 PSYCHOMETRIC TESTS FOR COMPUTER-COMPETENT</b>										
PIAAC Literacy	0.087 ***	-0.008	-0.046 ***	0.041	0.032	0.035	0.086 *	0.093 ***	0.046	0.148 ***
PIAAC Numeracy	0.015	0.115 ***	0.061 ***	0.100 ***	0.129 ***	-0.038	0.043	0.101 ***	-0.004	0.011
PIAAC Problem-solving	-0.004	-0.009	-0.015	-0.066 ***	-0.065 ***	0.042 **	-0.018	-0.089 ***	-0.024	-0.059 ***
Index (Three Tests)	0.036 ***	0.039 ***	0.003 ***	0.036 ***	0.044 ***	0.009 ***	0.044 ***	0.053 ***	0.010 ***	0.043 ***

Source: Table 24A of the report based on various years of NGS data.  
The estimates include all control variables except for education, \* p<0.1, \*\* p<0.05, \*\*\* p<0.01



Identifying the separate effects of literacy, numeracy and problem-solving skills is difficult since there is likely insufficient variation among the skills to identify their independent effects. This is especially the case for individual target groups given their smaller sample size. These separate effects are best illustrated in Table 6. This table simply gives a count of the number of positive and statistically significant effects for the separate components of literacy, numeracy and problem-solving skills, for all persons and for the four target groups.

**Table 6:**  
**Number of Positive and Statistically Significant Effects on Earnings for 2 and 5 Year Follow-Up Years for Different Groups, NGS Data**

	All Persons (1)	Immigrant (2)	Aboriginal (3)	Journey person (4)	PWD (5)
<b>ANNUAL EARNINGS 2 AND 5 YEARS AFTER GRADUATION</b>					
<b>8 SELF-REPORTED LES</b>					
Index	7/7	5/5	7/7	1/2	7/7
<b>2 PSYCHOMETRIC TEST SKILLS FOR ALL</b>					
Literacy	4/7	2/5	0/7	0/2	3/7
Numeracy	4/7	0/5	2/7	0/2	2/7
Index 2 skills	7/7	5/5	7/7	0/2	7/7
<b>3 PSYCHOMETRIC TEST SKILLS FOR COMPUTER-COMPETENT</b>					
Literacy	4/7	2/5	0/7	0/2	2/7
Numeracy	4/7	0/5	2/7	0/2	2/7
Problem-solving	0/7	0/5	0/7	2/2	0/7
Index 3 skills	7/7	5/5	7/7	0/2	7/7

Source: Table 29 of report using NGS data. Estimates include all control variables except for education

The effect on earnings of the three indexes of LES is positive and statistically significant for all persons and for each of the target groups.

The exception to the positive effect for all indexes is for journeypersons, where the index of eight self-reported skills is positive in both cases, but statistically significant in only one of the two cases. The index of two psychometric test scores and three psychometric test scores for journeypersons who are computer-competent are not positive or statistically significant. As was the case with the PIAAC data, this absence of a significant positive effect of LES for journeypersons likely reflects the possibility that journeypersons have other unobservable characteristics that affect their earnings. When these factors are controlled for, as in the census data discussed previously, LES has the largest positive effect on journeyperson earnings of all target groups.

The separate effect of numeracy and literacy for all persons (Table 6, column 1, panel 2), is positive and significant in four of the seven cases.

For those who are computer-competent (Table 6, column 1, panel 3), numeracy and literacy skills also have a positive and significant effect in four of the seven cases, but problem-solving skills, surprisingly, never have a positive effect on earnings. Reasons for this are not obvious. It is possible that computer skills often involve the application of menu-driven routine tasks and are a substitute for problem-solving skills, or that problem-solving skills take longer than five years after graduation to have an effect on earnings. More research is necessary to explain this puzzling finding.

For the four target groups, the separate effect of literacy, numeracy and problem-solving are seldom positive or statistically significant. The smaller sample sizes for the separate target groups likely lead to insufficient variation in the separate components of literacy, numeracy and problem-solving to identify their independent effects. An exception is for journeypersons, where problem-solving skills are positive and statistically significant in the two years where data was available. For most persons who are computer-competent, problem-solving skills do not appear to be important in fostering higher earnings. As indicated previously, the routine and menu-driven commands of computers may have reduced the importance of problem-solving skills. For journeypersons who are computer-competent, however, such problem-solving skills appear to be important and lead to higher earnings.

Overall, the indexes show positive effects for all persons and for the target groups.



## 9.0 Conclusion

Based on the analysis, the links between LES skills and pay are almost always positive, statistically significant and quantitatively large. This overwhelming positive effect from multiple lines of evidence and measures of LES across groups is remarkably consistent. This research provides robust evidence of the positive effect of LES on pay.

These findings apply across:

1. all three data sets
2. all three indexes
3. all persons, including target groups

Overall, the researchers found that estimating the independent effect of the separate components of literacy, numeracy and problem-solving skills is difficult because they are highly correlated with one other and with other determinants of pay, yielding little independent variation. This is especially the case given relatively small sample sizes afforded by target groups. There is considerable diversity in the importance of the different skills across various groups, highlighting that a “one-size-fits-all” solution is inappropriate.

Here are some specific findings from the research related to the three data sources:

- **Programme for the International Assessment of Adult Competencies:** In the PIAAC data, numeracy skills tend to have larger positive effect than literacy skills for all persons and for the different target groups, except for immigrants where literacy skills tend to have larger positive effects on earnings. These results highlight the importance of numeracy skills in the information economy for all workplaces, not just those where computers are prevalent. Although the findings in the census and NGS are more mixed, the results overall suggest that numeracy skills may have a greater effect on increased earnings than literacy skills.
- **2006 Census:** The analysis of census data indicates a causal effect on pay. For the index of the sum of all eight of the self-reported skills, every standard deviation increase in the LES index for all persons is associated with a 16 per cent increase in their weekly earnings, implying an increase of \$112 from the average of \$702. The effects are slightly smaller for each of the four target groups: 13.6 per cent for persons with disabilities, 13.2 per cent for Aboriginal persons, 11.9 per cent for journeypersons and 9.3 per cent for immigrants. For those who are computer-competent, every one point increase in their index of literacy, numeracy and problem-solving gives rise to a 9.7 per cent increase in their earnings.
- **National Graduate Survey:** According to the analysis of the NGS, the effect on earnings of the three indexes of LES is positive, statistically significant and quantitatively large. For example, a standard deviation increase in the self-reported LES index is associated with a 13.5 per cent increase in earnings. The changes between two and five years after graduation for all three of the indexes of LES are positive and statistically significant, highlighting that the positive effects tend to grow or appreciate, at least over that three-year period of time post-graduation.

Relevant conclusions can be drawn for each of the target groups based on the research findings:

### **Key Messages for Tradespeople**

- Based on the census data, journeypersons tend to receive the largest positive effect from LES compared to all persons and to any other target groups. This highlights the importance of investing in LES, prior to training, during training and as part of life-long learning. Employers should also be encouraged to support LES development during all of these stages.
- Improved LES fosters higher pay, emphasizing their importance in today's knowledge economy. This is an important message for youth, parents and teachers who may feel tradespeople can get by with weaker skills. This is simply not the case and the importance of essential skills and lifelong learning should be emphasized in career awareness outreach.

### **Key Messages for Aboriginal Persons**

- The indexes of LES are generally associated with higher pay for Aboriginal persons in the PIAAC and NGS data, although only for the index of eight self-reported skills in the researcher-preferred estimates from the census. Further reflection is required to understand the conditions that may impact skills development among Aboriginal workers. Factors may include the job turnover experienced among a large number of young Aboriginal persons who work in the resource sectors, the high dropout rate from secondary school, lower educational attainment in post-secondary and a lack of basic LES. As Aboriginal peoples become more integrated into the broader labour market and their educational attainment improves, they will likely benefit from LES similar to the general population and other target groups.

### **Key Messages for Immigrants**

- Higher LES consistently fosters higher pay for immigrants based on all three data sets and for all three indexes of LES. This clearly highlights the importance of LES in fostering the integration of immigrants into the Canadian labour market.
- The evidence is not consistent across the different data sets regarding which skill has the most impact, but there is some evidence to indicate literacy skills made the most significant difference to immigrants.

### **Key Messages for Persons with Disabilities**

- Higher LES is consistently associated with higher pay for persons with disabilities based on the census and NGS data, where information is available. These findings highlight the importance of LES in fostering the integration of persons with disabilities into the Canadian labour market.
- Evidence from the census suggests that investing in numeracy skills may be more important than literacy skills for this group.

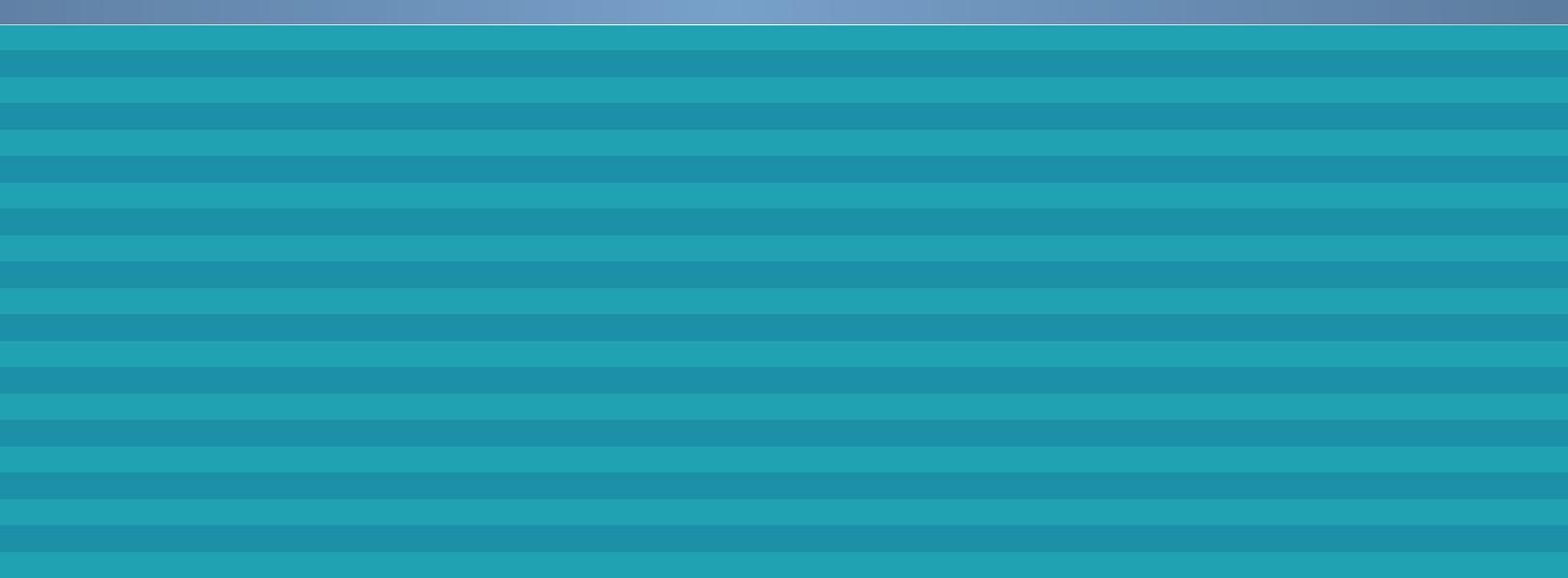
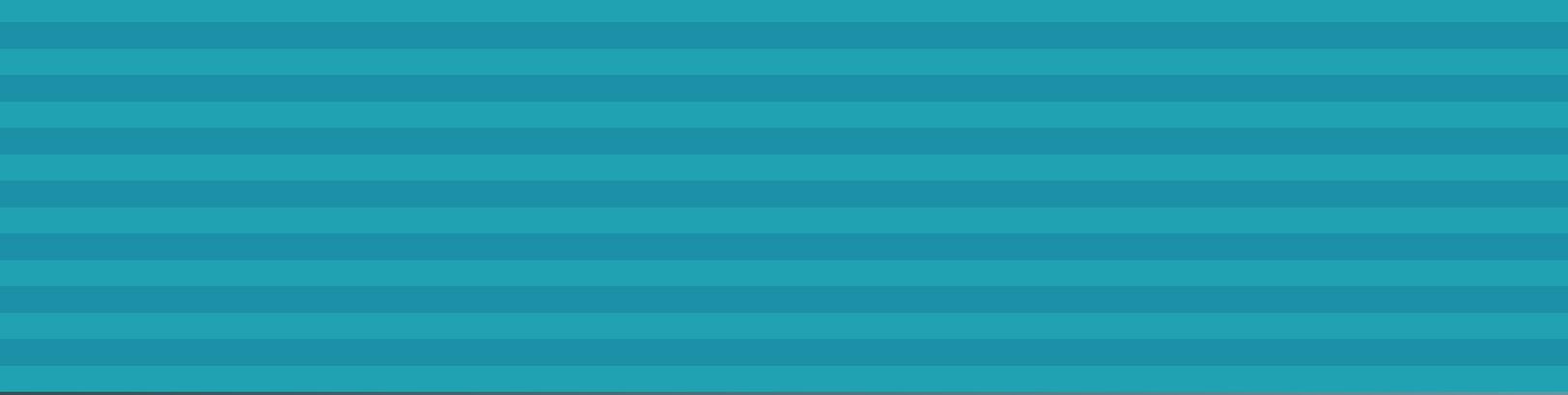
Based on extensive data analysis, this research found there is a positive and statistically significant relationship between LES and wages. There are direct financial benefits for workers who have strong LES.



## 10.0 Future Research

Considerations for future research include:

- The data on apprentices is limited. In order to create a better data set, consideration should be given to pre-and post-essential skills testing for apprentices at each level and upon completion. This testing would help to evaluate LES development and any links between LES and completion. Having access to longitudinal and detailed data would be helpful to researchers.
- Separating the data on journeypersons who received their status through the apprenticeship route versus those who became certified through the trade qualifier route would allow for analysis of differences between the two pathways.
- More data collection by trade would help identify which essential skills matter the most to specific trades.
- For the Aboriginal population, some of the depreciation that was found in the effect of their LES may reflect the instability of employment for large numbers of youth in the Aboriginal workforce. It may be informative to look at results from older Aboriginal workers where there is more stability in their careers and less job change to further analyze the impact of LES on wage growth.





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