Addressing Canada's Literacy Challenge: A Cost/Benefit Analysis

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Executive Summary

This report makes the case for an urgent investment to solve Canada's literacy "problem".

Recently published analyses presented establish that:

- literacy is economically and socially important to individuals, with differences in literacy score explaining a significant proportion of social inequality in a range of outcomes.

- literacy is important to macro-economic performance, with differences in the average level of literacy explaining 55% of differences in long term growth rates of GDP per capita and labour productivity in OECD economies. The distribution of literacy skill has also been shown to have an impact, with higher levels of low skilled adults inhibiting GDP growth.

- literacy is likely to become more, rather than less, important as the global knowledge economy continues to grow.

The report suggests that it is possible to conceive of Canada's literacy "problem" as an opportunity.

Canada's workforce possesses one of the highest levels of education, skill and experience in the world, a fact that represents an enormous economic potential.

Releasing this potential depends on Canadians having access to the tools they need to compete in a fiercely competitive global economy.

Simply put, the report authors believe that advanced literacy is the single most important tool that Canadians need to compete.

Yet 48% of the adult population do not possess Level 3 literacy - the level thought to be needed to take full advantage of opportunities present in the global economy.

The report submits that providing all Canadians' with Level 3 literacy skill will depend upon three things:

- educators matching their program offerings to the diverse needs of learners',

- sufficient investment to support program delivery of the needed scale, and,

- the participation of 48% of the adult population in literacy upgrading.

A case can be made that the Canadian literacy market is seriously inefficient. This inefficiency can be traced to several things including the possibility that:

- many adults have no way to judge the adequacy of their skill, a fact that causes them to under-invest.

- many of the benefits that would accrue to an increase in literacy are indirect. Such externalities lead potential learners, and the firms they work for, to under-invest.

- the product offering in the literacy market may not be well matched to learners needs and characteristics.

- the product offering is not of sufficient quality to consistently raise skills to the requisite level.

This report represents an attempt to improve the efficiency of the literacy market through the provision of hitherto unavailable market intelligence.

The report builds on a segmentation analysis of the Canadian literacy market undertaken by the authors and published by the Canadian Council on Learning (CCL, 2008).

The CCL analysis revealed that the presence of 12 distinct market segments, each defined by a unique set of learning needs and demographic characteristics.

Responding to the diverse needs and characteristics of the literacy market requires a highly differentiated program response. The CCL report documents what experts believe to be "best practice" program responses for each market segment.

The content and modes of instruction differ greatly among the market segments. For example, the number of instructional contact hours varies among the market segments from a high of 375 to a low of 40, and average class sizes vary from 5 to 20. These differences translate into large differences in unit instructional costs that range from a high of $4441 to a low of $229 per participant.

This report presents estimates of the total cost of raising the literacy skill of the adult population to Level 3 - the level thought to be associated with maintaining competitiveness in the emerging global knowledge economy.

Combining the size of each segment and the unit cost of instruction, the report provides a first order approximation of the cost of raising all Canadian adults to the desired proficiency level of $6,400,975,510.

The report also provides two sets of estimates of economic benefits that might be precipitated by an investment of this magnitude.

According to the first benefits analysis, the total estimated partial annual return on investment would be $16,083 million.

The bulk of these benefits would be in the form of increases in aggregate earnings that are associated with predicted increases in the incidence of employment, months worked, hours worked and wage rates.

The increased level of earnings from employment would increase aggregate income tax revenues at the national level by $ **11,140 million.**

Anticipated annual decreases in Employment Insurance and Social Assistance benefits would generate an additional $542 million and $4,351 million respectively as a result of higher paying, more stable employment.

These national estimates of costs and benefits imply a rate of return of roughly 251% per annum, and an approximate pay back period of 4.8 months, an attractive rate of return by any standard.

These are likely under-estimates of the true economic returns because they exclude a range of indirect economic benefits associated with lower health, social and educational costs and increased revenue from consumption taxes. Adding in these additional benefits would strengthen the case for investment.

The estimated economic benefits vary considerably by province and territory as a result of differences in their industrial, occupational and wage structures. In a few cases, moving adults to Level 3 precipitates a slight drop in earnings. This reinforces the need for government policies to stimulate the level of skill demand in the economy, policies that would ensure that the Canadian

economy is able to absorb and apply the newly created literacy skills.

The report does not include estimates of rates of return by province and territory because the sample sizes available in the ISRS study were not large enough to provide reliable estimates of the size of the market segments at this level.

A second benefits analysis, one that uses the historical relationship between literacy skill and the rate of overall economic growth to derive an alternate estimate of the economic benefits, also provides evidence of large positive benefits.

A literacy investment of the proposed magnitude is estimated to yield significant rates of return. The following table suggests estimated rates of return of 36%, 80% and 83% over 5, 10 and 25 years respectively, attractive by any standard.

	Discount rate	Internal rate of return
Net Benefit (25 year horizon)		
$1,949,871,628,673	0	83%
$825,264,279,156	0.05	
$385,563,050,106	0.1	
Net Benefit (10 year horizon)		
$164,333,771,476	0	80%
$109,067,514,464	0.05	
$73,940,546,975	0.1	
Net Benefit (5 year horizon)		
$8,890,902,805	0	36%
$6,380,331,391	0.05	
$4,506,380,138	0.1	

The fact that these estimates are lower than the estimated direct benefits suggests that the Canadian economy will have difficulty absorbing the additional supply of literacy skill. This reinforces the need for measures to increase the demand for literacy skill to complement the supply-side investments.

The authors suggest that different institutions should assume responsibility for different groups of learners.

A strong case can be made for the federal government to assume responsibility for the four immigrant-dominated classes. Higher levels of Federal investment in immigrant literacy and language training would permit these highly educated new Canadians to achieve their full economic potential.

The fact that these classes also contain most of Canada's aboriginal adults with low literacy skills also argues for a strong Federal role.

An equally strong case can be made that provincial governments should assume responsibility for their non-aboriginal Canadian-born peers in the four lowest skilled classes. Adults in these classes either left the education system without the requisite skills or were not equipped with durable skills.

It is not clear who should assume financial responsibility for the two highest classes. While a case can be made that individuals and their employers should assume the cost of remediation, governments may have to offer tax incentives to induce them to do so. There is strong prima facie evidence of market failure in the literacy market of the sort only governments have the tools to fix.

At one extreme governments might choose to invest in social marketing to increase the awareness of, and demand for, literacy programs. At the other extreme governments might choose to finance the full cost of the literacy investment.

While the optimal mix of policy remedies is a matter for public discussion and debate, the report concludes that there can be little question that action is needed if Canadians are to realize their full economic potential.

Foreword

I have come to have a passion for literacy and believe that finding ways to increase average levels of adult literacy is one of Canada's most pressing policy priorities.

I have, however, come to my passion for literacy through reason. Having spent a lifetime documenting the causes and consequences of practically every social ill that besets Canada – from low productivity growth to unemployment, from social exclusion to ill health and from exploring the causes of high school drop out to the brain drain and gain – I am convinced that literacy is the key to unlocking Canadians' vast economic and social potential.

I have been frustrated by the fact that many Canadians have failed to apprehend either the benefits that would accrue to higher literacy levels or the dire economic risks that are associated with inaction on the literacy front.

Much reflection has led me to believe that the failure to act can be traced back to what in economics is known as a "market failure" in which the market on its own fails to allocate resources efficiently.

The causes of the literacy market failure can be traced to a few simple facts.

First, the nature of the literacy "problem" in Canada has not been well articulated. Canadians know which population groups have low skill but have little awareness of the impact that literacy skill has on their individual and collective economic success.

Markets only work well when both buyers and sellers have a clear idea of the costs and benefits that would be associated with the purchase of additional literacy skill and this is clearly not the case with most Canadians, or their policy makers.

Second, the cost of improving average literacy levels has been unknown.

Third, there is some evidence that the current offering of literacy products and services available to potential consumers does not reflect their needs.

Fourth, the presence of large externalities to literacy improvement has led to underinvestment on the part of individuals and firms. For example, literacy investments have been shown to reduce the incidence of crime, a relationship that translates into economic benefits for the general public.

Fifth, public policy has assumed that the K-12 education system would solve the literacy problem.

Sixth, policy makers have underestimated the contribution of literacy and other essential skills to economic growth, choosing to focus their attention and investment on other determinants of productivity growth, including the elite end of the skill distribution.
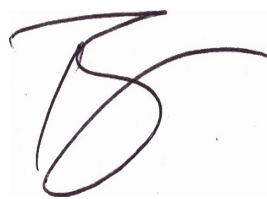
Seventh, literacy advocates in Canada have given little weight to the economic rationale for literacy investment, arguing instead for investment as a moral imperative.

Eighth, many of the policy makers who advise governments are highly educated, to the point where they simply cannot imagine what it is like to have to function without the tool we know as literacy.

Finally, the simple magnitude of the problem - with an estimated 48% of adult Canadians in need of some literacy upgrading - made many politicians avoid the issue.

This report is intended to improve the efficiency of the Canadian literacy market by providing the key market players with the kind of information that is available for virtually all other market sectors.

If it succeeds Canada will be a wealthier, healthier and more equitable place in which to live.

T. Scott Murray

Table of Contents

List of Tables

List of Figures

Abbreviations

2PL	Two-Parameter Logistic Model
ALL	Adult Literacy and Life-skills Survey
DS	Digit Span
ESL	English as a Second Language
GDP	Gross domestic product
IALS	International Adult Literacy Survey
IALSS	International Adult Literacy and Skills Survey
ICT	Information and communications technologies
IRT	Item Response Theory
ISRS	International Survey of Reading Skills
LCA	Latent Class Analysis
OECD	Organisation for Economic Co-operation and Development
PPVT-m	Peabody Picture Vocabulary Test (modified)
PSU	Primary sampling units
RAN	Rapid Automatized Naming – Letters
TOWRE-A	Test of Word Reading Efficiency – Real Words
TOWRE-B	Test of Word Reading Efficiency – Pseudo-words

Chapter 1
Introduction

Literacy – the ability to gain information through the printed word – has played a pivotal role in providing Canadians with one of the highest standards of living in the world.

Differences in average adult literacy level have been shown to exert a profound influence on key indicators of economic success, explaining as much as 55% of long term differences in the long term growth rate of GDP per capita and productivity growth at the national and international level (Coulombe, Tremblay and Marchand, 2004; Coulombe and Tremblay, 2006, Coulombe and Tremblay, 2006). The same research also suggests that the distribution of adult literacy skill has also influenced the long term economic success of Canada and its economic peers. Specifically, the higher the proportion of adults with very low literacy skill, the lower overall rates of long term GDP growth.

Research has also established a strong relationship between literacy and a range of outcomes at the individual level.

Differences in literacy skill are associated with large differences in employability, wage rates, income and reliance on social transfers, such as social assistance. Adults with higher literacy skills work more, experience less unemployment, earn more, spend less time unemployed and rely less on government transfers (Osberg, 2000; Green and Riddell, 2002; Green and Riddell 2003; Green and Riddell 2007; Raudenbush and Kasim 2002, Statistics Canada and the OECD, 2005).

Literacy has been shown to have an impact on the success of firms. Literacy contributes to effective communication and increases overall productivity. Literacy skill has been shown to influence the acquisition and application of information and communication technologies in daily life, including the workplace. Adults with high levels of literacy are much more likely to become proficient users of these technologies, and are much more likely to find themselves in high wage stable jobs, a clear sign of literacy's economic value to firms (ETS, 2003). Higher levels of literacy increase employee retention and reduce the incidence and severity of workplace illness and accident (Murray and McCracken, 2008).

It has also been suggested that higher literacy levels would reduce the cost of delivering public goods and services such as health and education, or at least would make existing tax expenditures more productive.

Literacy is also intimately related to the efficiency and effectiveness of the learning process itself. Students who acquire sufficient literacy skills are able to become independent learners and hence increase the productivity of the educational process enormously. Differences in literacy skill have also been shown to have a profound influence on various aspects of educational success including the probability of dropping out of high school, the probability of high school completion, post-secondary participation, the level of post-secondary participation, the probability of graduation and the level and intensity of participation in formal adult education and training (Willms, 2003; Knighton and Bussiere, 2006; Rubensson and Desjardins, 2007).

Literacy has also been linked to individual health outcomes including the probability of experiencing illness, the length of recovery, the cost of treatment and the age at death. Individuals with low literacy skill get ill more often, experience more workplace illnesses and accidents, take longer to recover, experience more mis-medications and die younger (Rudd, Kirsch and Yamamoto, 2004).

Finally, literacy has been shown to have a strong impact on the degree of engagement in the broader society. Adults with lower literacy skill levels participate less in community activities, volunteer less and are less likely to vote (Statistics Canada and OECD, 2005; HRSDC and OECD 2000).

Level 3 has been identified as the proficiency level needed by students to support independent learning and by adults to compete fully and fairly in the emerging global knowledge economy and information society (Statistics Canada and OECD, 1995).

Level 3 skills are known to be associated with satisfactory job performance in the overwhelming majority of Canadian occupations, with the effective use of health information and with full and active participation in the community and the overall society (HRSDC, 2006; Murray, Rudd, Kirsch, Yamamoto, Clermont and Grenier, 2007; Statistics Canada and OECD, 2005).

This evidence leaves little doubt that literacy is socially and economically important. Canada's labour markets, education system, health system and social system recognize and reward individuals with higher skills – so much so that one can think of these markets as engines for creating inequality in some of the things Canadians value most – wealth, health, learning, self-reliance and belonging.

The evidence also suggests that literacy skill will become increasingly important in the future (Murray and McCracken, 2008; Canadian Council for Learning, 2007; ETS, 2007).

The global supply of literacy is rising rapidly in response to massive educational investments. Access to a skilled and literate workforce allows firms in the developing world to compete on both price and quality. This places intense price pressure on Canadian firms and creates significant financial incentives for firms to move production to lower cost countries.

Markets for goods and services are increasingly global, offering huge opportunity and economies of scale to those firms able to compete.

Markets for key inputs – financial capital, technology and high end human capital – have gone global, effectively increasing the relative importance of the skills of the workforce for both competitiveness and public policy.

Confronted with rapidly rising competition, Canadian firms have few options. One of the few ways in which they can remain competitive is by adopting more efficient work organizations and technologies. By definition, these work organizations are more knowledge and information-intense and, thus, demand workers with much higher levels of essential skills, most notably higher literacy levels.

Although Canada has a relatively high average level of adult literacy, a significant proportion of Canadian adults score below the level of literacy skill thought to be needed to compete in the emerging global knowledge economy (Statistics Canada and the OECD, 2005).

In view of these facts, one would expect that low skilled adults would be clamouring to raise their literacy levels, that Canadian firms would be offering literacy upgrading to their workers and that Canadian governments would be investing public resources to raise average skill levels and to reduce the proportion of adults with low literacy skills.

The reality is not as expected.

The overwhelming majority of Canadian adults with low literacy skills believe that their skills are adequate and see no need to invest in raising their literacy skill level.

Despite their reliance on foreign markets, Canadian firms train less than their peers in other countries and are much more likely to offer training to workers who are already highy skilled and literate (Tuijnman and Boudard, 2001).

Although aware of the problem, Canadian governments have invested nowhere near the resources needed to raise overall literacy skill levels.

The failure to act can be interpreted in two ways. Either literacy is not as important as the evidence would suggest or there is a market failure of magnificent proportions.

The availability of data from the International Adult Literacy Survey (IALS) and the Adult Literacy and Life Skills Survey (ALL) has provided policy makers and planners with a nuanced portrait of the distribution of literacy skill by proficiency level and of the characteristics of low skilled individuals, including their geographic distribution and demographics. These data leave little doubt that literacy is important and will become more so in the future.

The availability of data from the International Survey of Reading Skills (ISRS) has provided hitherto unavailable information on the literacy learning needs of different groups of adult Canadians and a sense of what types of remedial programs might best suit these needs.

This report builds upon an analysis of the ISRS data published by the Canadian Council on Learning (CCL, 2008).

The CCL study provided a nuanced profile of the literacy learning needs of different groups of low skilled Canadians and identified the most efficient and effective means of raising the literacy skills of each of these groups.

This report provides four new sets of estimates:

- Estimates of the cost of raising literacy skills to the desired level for each of the groups identified in the CCL analysis.

- Estimates of the economic benefits that might be precipitated by an investment of the indicated amounts under the assumption that the Canadian economy is capable of absorbing all of the new literacy skill as it is created.

- Estimates of the economic benefits that might be precipitated by an investment of the indicated amounts under the assumption that the Canadian economy absorbs the new literacy skill at the same rate it has over the past 50 years.

- Estimates of the potential rates of return implied by the estimated costs and potential benefits.

The cost/benefit analyses presented in this report are primarily designed to serve the information needs of four audiences.

First, the analyses will serve the needs of firms in the literacy industry. Armed with a clearer idea of the size of each of the important market segments and their revenue potential, firms in the literacy industry can make better investment and marketing decisions.

Second, the analyses provide politicians, and their policy advisors, with a clearer set of policy options related to literacy. The efficiency and effectiveness of Canada's current remedial literacy investments are limited by the fact that current data provide little insight into the learning needs of different groups of adult Canadians with limited literacy skill nor do they reveal anything about what the expected costs and benefits would be to any group.

The adult literacy issue first surfaced on the public policy agenda in Canada in the early 1980's (CMEC, 1988). Politicians initially failed to act on the literacy issue because they thought that the problem would solve itself as the education system cranked out more and more educated, and literate, graduates.

Subsequently, they failed to devote sufficient resources to literacy because they believed that Canada's literacy "problem" was no worse that that of our trading partners.

Currently, they are reluctant to invest more resources in literacy because they believe that individuals and firms bear the primary responsibility of solving their literacy problems themselves and, more importantly, that most have the means to finance the required investments.

This report allows these latter assumptions to be tested empirically. The report provides a first order approximation of the anticipated costs and benefits of helping different segments in the literacy market and a pragmatic assessment of each group's ability to pay.

Third, the report is designed to provide adults with low literacy skills with a better sense of what level of investment would be required for them to reach level 3 and what economic benefits they might expect as a result, assuming that employers share the associated productivity gains.

Finally, the report has been designed to meet the needs of the voting public.

Despite the overwhelming evidence to the contrary, literacy has not been high on the public agenda. The voting public will not offer the political support needed for politicians to invest in literacy until they understand: how much our economic future depends upon raising adult literacy levels; who needs government help to finance the needed investments; and what the costs and benefits would be of helping different groups of learners.

In meeting the needs of these audiences the report offers answers to a series of fundamental questions, including:

- *What would it cost to raise all Canadian adults to the level thought needed to compete in the global economy i.e. prose literacy Level 3?*

- *Which groups of adults have the financial resources to help themselves?*

- *Which groups of adults have employers who could, and should, bear the cost of upgrading their skills?*

- *How much would governments have to invest to offer literacy upgrading to the remaining adults?*

- *How much would governments have to invest after taking into account the economic benefits that are expected to flow from having higher literacy skills?*

Organization of the report

The report has been structured to respond to the issues set out above, presenting information in five chapters.

Chapter 1 introduces the report and provides background on the Adult Literacy and Life Skills Survey (ALL) and the International Survey of Reading Skills (ISRS) studies upon which the current analyses are based.

Chapter 2 provides readers with a summary of what was measured in the ISRS study and how the data can be used to support a better understanding of the literacy market in Canada.

Chapter 3 summarizes what analysis of the ISRS has revealed about the influence that component reading skills exert on the acquisition and application of fluid and automatic reading, what the patterns of strength and weakness on the component reading measures imply about the learning needs of different segments in the Canadian literacy market and what experts believe to be the "best practice" program response given each group's special needs and characteristics.

Chapter 4 provides detailed estimates of the unit costs, and total costs, of raising adults in each market segment to Level 3 using the "best practice" program responses proposed in the CCL analysis. Level 3 was chosen because it is the level identified by the OECD as the minimum level required to compete fully and fairly in the emerging global knowledge economy.

The chapter also presents two sets of estimates of the economic benefits that are expected to flow from a literacy investment large enough to raise all adults to Prose Level 3.

A comparison of estimated costs and expected direct economic benefits provides a first order approximation of the magnitude of the expected returns on investment.

Chapter 5 summarizes the report's findings and makes recommendations for policy.

Annex A provides references to related work.

Caveat lector

The ISRS assessment of component reading profiles and learning needs of low skilled adults is by far the largest of its kind ever undertaken in Canada. The study used a large, representative sample of adults in order to support the generalization of results and also provides a means to estimate the absolute number of different types of adult learners in the population.

Despite the utility of the ISRS findings for educators and policy makers, the study is not without its limitations.

Analyses must be conducted separately for English and French test takers because all component tests but one were equivalent, but not identical, in the two languages. Some issues of interpretation also arise because not all Francophone respondents who participated in the previous literacy assessment took the survey in French. In fact, 65 percent of the Francophone population residing outside the province of Québec opted to take the test in English.

Interpretation of the findings is also made more complex than is usually the case in survey research because the population sampled for the ISRS is a subgroup of those who participated previously in the IALSS, with a focus on those scoring at the lowest levels of literacy proficiency. Unfortunately, the least literate respondents were also those who had the highest refusal and non-response rates among those sampled. Care has been taken to limit the impact that these response differentials have on the resulting estimates.

Large as they are compared to other research studies in the field, the sample sizes fielded in the ISRS are still relatively small. The limited number of low skilled respondents available from the IALSS and the high cost of administering the component reading tests to a geographically widely distributed sample of adults in 10 provinces, precluded further increases of the ISRS sample sizes. Having established the utility of the approach, future research could expand the scope of the enquiry in useful ways.

Given the link of the ISRS to major comparative literacy assessments, every effort was made to establish the validity, reliability, comparability and interpretability of estimates, and to control and quantify errors that might interfere with, or bias, interpretation. Notes to figures and tables are used to alert readers whenever errors might affect interpretation. The data presented in this report are estimated from representative but complex samples of adults in Canada. Tables reporting the results of the data analyses are included in the body of the report. Even though the sample size of the ISRS is the largest that has been used for this type of study to date, some of the resulting statistics were still deemed unreliable and as such suppressed in the data presented in this report.

Readers should note that the ISRS estimates of the number of Canadian adults aged 16 and over who are at prose literacy levels 1 and 2 published by Statistics Canada are lower than those obtained from the ALL study. A small part of this difference can be attributed to the fact that three northern territories were excluded from the ISRS sample. A larger part can be attributed to the way in which the ISRS data were weighted. These adjustments did not involve benchmarking to the ALL skill distributions. The cost/benefit estimates presented in this report have been adjusted upward to reflect the full extent of the literacy market in Canada.

Readers should also note that some of the estimates contained in this report differ from those published by Statistics Canada. This is due to the fact that the current analysis used all five plausible values to compute proficiency scores whereas the Statistics Canada estimates are based upon the first plausible value only.

Chapter 2
Understanding what was measured in the ISRS

This chapter provides general background on the Adult Literacy and Life Skills Survey (ALL) and the International Survey of Reading Skills (ISRS) studies upon which the current analyses are based, and more specifically on the reading component measures that were used to identify different groups of adult learners based upon their patterns of strength and weakness in the underlying mechanics of reading and their demographic characteristics.

The chapter draws heavily on analysis presented in two reports – an initial release of ISRS findings published in *Learning Literacy in Canada: Evidence from the International Survey of Reading Skills* (Statistics Canada and HRSDC, 2007) and a more detailed analysis presented in *Reading the Future: Planning to Meet Canada's Future Literacy Needs* published by the Canadian Council for Learning (CCL, 2008). The former report included a summary market segmentation analysis that revealed the different types of adult learners that the battery of clinical reading assessments allowed one to identify. The latter report included a more detailed segmentation analysis of the Canadian literacy market.

Readers are referred to these two publications for detailed information on the ISRS study, its methods and early findings.

The Adult Literacy and Life Skills Survey (ALL), and the International Adult Literacy Survey (IALS) that preceded it, were based upon advances in theory and measurement of adult literacy (Statistics Canada, 2005).

One of the key insights afforded by these studies is that the relative difficulty of adult reading tasks depends much less upon the characteristics of the text but rather the characteristics of the task which the reader is asked to perform.

This insight opened the way for the measurement of adult literacy skill in a valid, reliable, comparable and interpretable way in multiple languages and heterogeneous adult populations (Murray, 2003).

The theory and statistical models that are used to predict item difficulty, and to summarize literacy proficiency, do an excellent job in the upper regions of the proficiency range – i.e. Level 3 and above - where most cognitive effort is expended in applying fluid and automatic reading skill to help to solve unfamiliar problems, a process that has come to be known as "reading to learn".[1]

These same theories and associated statistical models are, however, not as robust in the lower regions of the skill distribution – where adults devote a good part of their cognitive energy to "learning to read".

The ISRS study attempted to increase our understanding of adult Level 1 and 2 learners by exploring the process of learning to read and the emergence of fluid and automatic reading.

The following background on the process of learning to read borrows heavily on the work of Sabatini (Sabatini, 2006) and Strucker (Strucker, 2007).

The basic principle of learning to read has been described by Perfetti as:

- '*What a child learns is how his or her writing system works – both its basic principles and the details of its orthographic implementation. We know this learning has occurred when the child can identify printed words as words in his or her spoken language in a way consistent with the writing system. For an alphabetic reader, this means being able to read unfamiliar words, and even non-words, as well as familiar words. For a Chinese reader, this means identifying familiar characters and being able to make informed guesses about the pronunciation or meaning of unfamiliar characters using their compositional principles. (This does not include reading non-words, which in Chinese is impossible, strictly speaking.) To be sure, much more is learned than how one's writing system encodes one's language. But this is the central learning even to which additional literacy learning, for example, comprehension strategies, must be connected.*' (Perfetti, 2003, p. 16).

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1. Above 276 on the 500 point IALS PROFICIENCY scales.

The same processes are believed to underlie reading acquisition in adults, that is, the comprehension or 'meaning construction' processes of reading are built upon a foundation of component skills and knowledge of how one's writing system works.

Measuring component reading skills provides a better understanding of "reading" profiles at the low end of the literacy spectrum. The application of these measures in English and French adopts the assumptions of the simple view of reading to maximize useful profile information as described by Hoover & Tunmer (1993):

- *"the simple view makes two claims: first, that reading consists of word recognition and linguistic comprehension; and second, that while each of these components is necessary for reading, neither being sufficient in itself." (p.3) Word recognition is a stronger predictor of reading level in the early years of reading development. As word recognition becomes more fluent and automatized, listening comprehension becomes a stronger predictor of reading ability, though word recognition continues to contribute significant variance even in skilled readers* (Gough & Walsh, 1991; Cunningham, Stanovich, & Wilson, 1990; McCormick, 1994).

Most current models of reading development recognize the necessity of acquiring proficiency in lower level reading skills to enable development of increasing capabilities of higher level com-prehension skills (Abadzi, 2003; Perfetti, 1985, 1992, 2003). Consequently, it is important to measure not only the accuracy level in performing component skills, but also gain some sense of the degree to which they are becoming efficient, effortless, automatized, internalized and routine. Measuring speed or rate of response is a straightforward behavioral proxy for the cognitive constructs of automaticity and efficiency. More skilled individuals can perform routine processes more rapidly, while maintaining high accuracy, than individuals who are less skilled. Simply put, it is easier (and quicker) to do what one knows how to do, and easier yet (and quicker yet) if one knows how to do something well.

In reading, the range of skills and knowledge that can be performed with ease is an important indicator both of the reading level achieved and the prospective for future reading growth under different learning and experiential conditions. In the design of the ISRS components framework, specific timed exercises are included to measure these construct aspects.

Although not the only things upon which the emergence of fluid and automatic reading depend, research has shown that few learners manage to reach the Level 3 skill level without having mastered these "component" skills. Knowing an individual's level of performance on these tests explains fully 80% of their performance on the overall reading proficiency scale.

The same research shows that mastery of component skills is a necessary but insufficient condition to the acquisition of fluid and automatic reading. Other factors matter, including the degree to which learners can relate to the content of instruction and its salience for their lives. Much of the cost of teaching adults to read can be attributed to a need to adapt instruction to the experience and interest of adult learners.

Finally, the Level 3 threshold is also one that reading researchers believe represents a point at which there is an important shift in the underlying cognitive strategies that readers must deploy to access and apply information embedded in print.

Evidence about adults' level of component skills and knowledge can be captured by tasks that examine their ability and efficiency in processing the elements of the written language – letters/characters, words (and non-words), sentences, and larger, continuous text segments.[2]

Tamassia, Lennon Yamamoto and Kirsch (2007) used this simple view of reading acquisition in a study of American adults, describing the influence of *print components* (e.g., decoding accuracy and fluency) and *meaning components* (e.g., oral vocabulary) on the emergence of fluid and automatic reading as characterized by Level 3 on the IALS and ALL proficiency scales.

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2. The processes involved in adult reading acquisition are assumed to be similar to that of children. The acquisition process is, however, more complex as many adults have the benefit of some instruction and of life experience, albeit often in languages other than those being tested. The acquisition of literacy skills is also rendered more difficult for many adults because their prior negative school experience, the existence a variety of other life challenges and the fact that the methods and content of learning need to be adapted to the interests and realities of their lives.

The research literature suggests that five reading components can be used to predict the emergence of fluid and automatic reading:

"Print" components:

    a) alphanumeric perceptual knowledge and familiarity,

    b) word recognition,

"Meaning" components:

    c) word knowledge (vocabulary),

    d) sentence processing, and

    e) passage fluency.

In skilled reading, these components are integrated to support literacy performance.

During acquisition, they may be measured separately, with different profiles having implications for learning, instruction, and policy.

The main interest in testing reading component skills is to establish whether learners can apply their existing oral language and comprehension skills to the processing of printed texts.

It is generally assumed that adult learners have the basic oral vocabulary, syntactic/grammatical, and listening comprehension skills in the test language. This assumption clearly does not hold for immigrants whose mother tongues are neither English nor French. For this reason the ISRS study included a test of oral language fluency.

The components model of reading posits that the level of proficiency, efficiency, and integration of component skills is indicative of the level and learning potential in reading development. As skills and knowledge accumulate, so the ease of processing familiar text-based information increases. Component efficiency is typically indexed by assessing speed or rate of processing, as well as accuracy.

Adults spend extra time, effort, and energy to solve reading problems that are novel. On familiar reading tasks, adults can often respond, accurately, quickly, with seemingly little conscious effort. This allows them to devote more of their cognitive resources to solving and learning from more complex problems.

Component tests are designed to discriminate in the low end of the continuum of reading ability. The model of reading acquisition, development, and choice of item types and difficulties used to assess "components" proficiency holds most strongly in this range of non- and developing readers. Different assumptions about component inter-relationships may hold for a population of more skilled readers.

Component measures may be unique to language and culture, reflecting the fact that the relationship of the language to the writing system may be very different in different languages.

As noted above, the CCL report used data from the International Survey of Reading Skills (ISRS) to describe the reading abilities of the least-skilled adult readers in Canadian society. A related purpose was to identify the basic reading profiles of these adults, based on their strengths and needs in the "mechanics" of reading.

The CCL report thus provided policy makers, researchers and practitioners with information that could be used in developing better diagnostic systems for low skilled adults, for tailoring the content and modalities of instruction to their needs, and for creating improved social marketing tools to encourage active participation by adult learners.

As explained in Box 2.1, Canadian and US-based teams jointly developed the ISRS, building on the theories and assessment frameworks developed for two prior international assessments of adult literacy: the International Adult Literacy Survey fielded in 20 countries between 1994 and 1998, and the Adult Literacy and Life Skills Survey (ALL), implemented in seven countries or territories in 2003. Representative sub-samples of respondents to the English and French variants of the ALL were selected for the Canadian component of the ISRS. Since the ISRS was a follow-up to the ALL the information gathered from the two surveys could be combined and used together in analyzing the data. The Canadian component of ALL is known as the International Adult Literacy and Skills Survey (IALSS).

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**Box 2.1
The International
Dimension of the Study**

The ISRS has an international dimension not only because it builds on large-scale comparative assessments of adult literacy but also because its design, data collection and analysis involved several US and Canadian research teams.

The ISRS is a joint project of the Educational Testing Service, Princeton and Statistics Canada, Ottawa, implemented in co-operation with the National Center for the Study of Adult Learning and Literacy at the Harvard Graduate School in Boston and Westat, Inc. based in Maryland.

Human Resources and Social Development Canada and Statistics Canada funded the Canadian part of the study while the US part was financed by the Office of Vocational and Adult Education and the National Center for Education Statistics of the US Department of Education.

The US and Canadian studies had slightly different objectives and surveyed different populations but shared common approaches to measuring component reading skills. Initial results of the US study may be found in *Adult Education in America: A First Look at Results from the Adult Education Program and Learners Surveys*, ETS 2007.

</div>

Theory, Definitions and Instruments

"Low skill" in the ISRS was defined as proficiency below Level 3 on the IALSS prose literacy scale, a choice in keeping with the view that Level 3 is the desired threshold needed by adults to participate fully and fairly in the knowledge economy, given that Level 3 skills are known to be associated with satisfactory job performance in the overwhelming majority of Canadian occupations, with the effective use of public health information and with active community participation (Statistics Canada and OECD, 2005). The Level 3 threshold is also one that reading researchers believe represents a point at which there is an important shift in the underlying cognitive strategies that readers must deploy to access and apply information embedded in print.

The Canadian component of the ISRS selected representative sub-samples of a total of 1,815 respondents in the 10 provinces; 986 of them completed the tasks in English, and 829 did so in French. There were 232, 332 and 422 individuals at Levels 1, 2 and 3+ in the English sample, and 98, 312 and 419 individuals at Levels 1, 2 and 3+ in the French sample.

The ISRS was administered in respondents' homes using several instruments. First, respondents were invited to complete a background questionnaire, which consisted of several information modules required to relate the tested skills to social and economic background variables. They were asked a series of questions about their education, the language they use in various situations and their labour force status and another set of questions about health and disabilities. Next came the prose and document literacy components, which required respondents to complete a number of tasks. First there was a booklet of nine simple tasks, and if respondents successfully completed at least three of them, they were given another booklet containing 31 tasks. If they did not, they moved directly to the survey's third component, a series of additional exercises designed to measure reading-related component skills.

For prose literacy the IALSS definition is used – the knowledge and skills needed to understand and use information from texts including editorials, news stories, brochures and instruction manuals. Similarly, document literacy is defined as the knowledge and skills required for locating and using information contained in various formats, including job applications, payroll forms, transportation schedules, maps, tables and charts.

Prose literacy and document literacy are measured on a scale of 0 to 500. Each result on the scale represents a point at which a person has an 80 percent chance of correctly performing a task associated with an equivalent level of difficulty. To simplify reporting of the results, the scales are also divided into five levels, with each level representing a set of tasks that an individual at that level is capable of performing. Table 1.1 describes the increasing levels of task difficulty.

Table 2.1

Five levels of difficulty for the prose and document literacy scales

Level	Prose	Document
Level 1 **(0-225 points)**	Most of the tasks in this level require the respondent to read relatively short text to locate a single piece of information that is identical to or synonymous with the information given in the question or directive. If plausible but incorrect information is present in the text, it tends not to be located near the correct information.	Tasks in this level tend to require the respondent either to locate a piece of information based on a literal match or to enter information from personal knowledge onto a document. Little, if any, distracting information is present.
Level 2 **(226-275 points)**	Some tasks in this level require respondents to locate a single piece of information in the text; however, several distractors or plausible but incorrect pieces of information may be present, or low-level inferences may be required. Other tasks require the respondent to integrate two or more pieces of information or to compare and contrast easily identifiable information based on a criterion provided in the question or directive.	Tasks in this level are more varied than those in Level 1. Some require the respondents to match a single piece of information; however, several distractors may be present, or the match may require low-level inferences. Tasks in this level may also ask the respondent to cycle through information in a document or to integrate information from various parts of a document.
Level 3 **(276-325 points)**	Tasks in this level tend to require respondents to make literal or synonymous matches between the text and information given in the task, or to make matches that require low-level inferences. Other tasks ask respondents to integrate information from dense or lengthy text that contains no organizational aids such as headings. Respondents may also be asked to generate a response based on information that can be easily identified in the text. Distracting information is present, but is not located near the correct information.	Some tasks in this level require the respondent to integrate multiple pieces of information from one or more documents. Others ask respondents to cycle through rather complex tables or graphs containing information that is irrelevant or inappropriate to the task.
Level 4 **(326-375 points)**	These tasks require respondents to perform multiple feature matches and to integrate or synthesize information from complex or lengthy passages. More complex inferences are needed to perform successfully. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent.	Tasks in this level, like those at the previous levels, ask respondents to perform multiple-feature matches, cycle through documents, and integrate information; however, they require a greater degree of inference. Many of these tasks require respondents to provide numerous responses but do not designate how many responses are needed. Conditional information is also present in the document tasks at this level and must be taken into account by the respondent.
Level 5 **(376-500 points)**	Some tasks in this level require the respondent to search for information in a dense text that contains a number of plausible distractors. Others ask respondents to make high-level inferences or use specialized background knowledge. Some tasks ask respondents to contrast complex information.	Tasks in this level require the respondent to search through complex displays that contain multiple distractors, to make high-level text-based inferences, and to use specialized knowledge.

The clinical reading tests administered in the ISRS study measure the "component" decoding and print comprehension skills that are thought to underlie the emergence of the fluent and automatic reading that is characterized by Level 3 performance on the IALS and IALSS prose literacy scales. Although the emergence of fluid and automatic reading also depends on other factors, research studies have shown that few learners manage to reach Level 3 proficiency without having mastered these component skills. Hence mastery of component skills is a necessary but insufficient condition to the acquisition of fluid and automatic reading but other factors, also matter including the degree to which learners relate to the content of instruction and its salience for their lives. Individual performance on the clinical reading tests used in the ISRS explains fully 80 percent of performance on the overall literacy proficiency scale.

The component measures administered as part of the ISRS were selected for several related considerations.

First, it had to have been established on both theoretical and empirical grounds that the specific component was important to the acquisition of Level 3 skills. The theory and evidence underlying the reading components assessed in the ISRS is presented in Chapter 3 of the initial analysis of ISRS results (Statistics Canada and HRSDC, 2007).

Second, the measures had to be amenable to administration by non-specialist interviewers within the context of a household survey.

Third, the measures had to display good psychometric properties in terms of their validity, reliability and comparability.

Finally, equivalent measures were to be employed to assess component skills in both English and French. Although conceptually identical, it was found they did not provide results that are strictly comparable. Accordingly, the relationships among the components and between them and the emergence of fluent and automatic reading were shown to differ in certain respects between the two language groups. Apart from collecting data on the component reading measures,

the respondents to the ISRS also were assessed in terms of their ability to understand spoken English or French, and to speak intelligibly at a native conversational pace on everyday topics.

Six instruments were used to measure the reading-related component skills. The first was the abridged Peabody Picture Vocabulary Test (PPVT-m), which required respondents to identify which of four different images corresponded to a word spoken by the interviewer. Second came the Rapid Automatized Naming (RAN) test, in which respondents were asked to read a series of random letters as quickly as possible. The third exercise concerned the Test of Word Recognition Efficiency, requiring one to read a list of real words (TOWRE-A), followed by a list of pseudo-words (TOWRE-B), as quickly as possible. The time limit for each word list was 60 seconds. The fourth instrument was PhonePass, which contained three different tasks: repetition of simple sentences, a set of short-answer questions, and reading of simple sentences (see Box 2.2). The fifth test involved repeating a series of digits in order and another series of digits out of order. The final exercise was a spelling test.

Box 2.2

PhonePass Scale Scores, Levels and Sub-scales used in the ISRS

Phone Pass®

SET-10 Sample Score Report

ORDINATE

50
40   60
30   70
20   **OVERALL**   80
      SCORE

55   66   45   57

TEST IDENTIFICATION NUMBER: 12345678

DATE: November 14,2002

TIME: 2:34 PM (PST)

PRONUNCIATION

FLUENCY

VOCABULARY

SENTENCE MASTERY
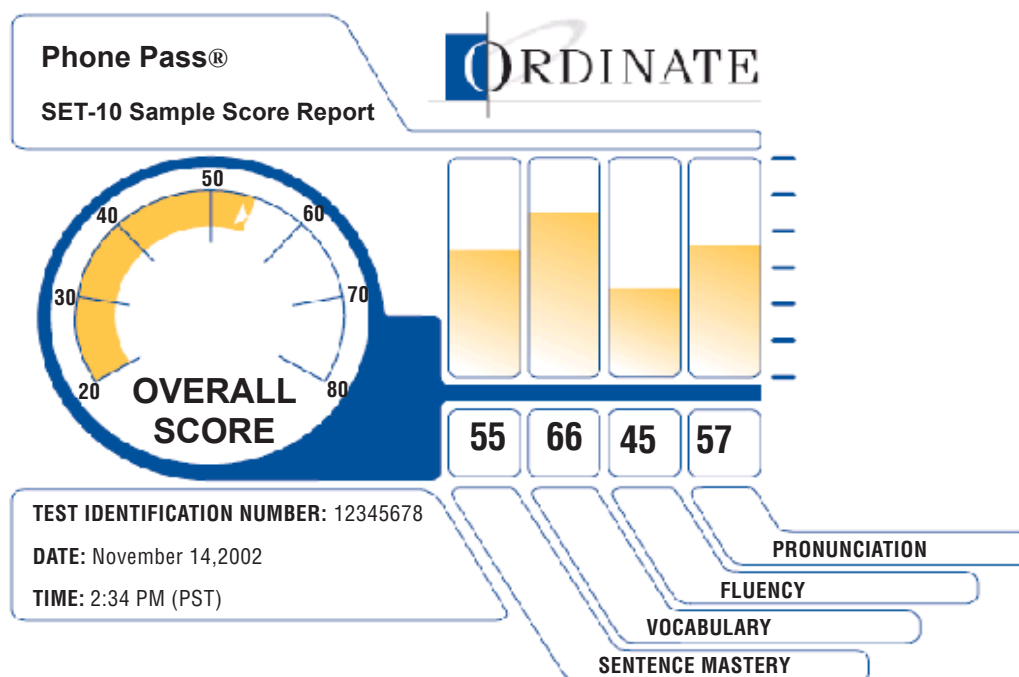
Overall Score

Tile Overall Score of the test represents the ability to understand spoken English and speak it intelligibly at a native conversational pace on everyday topics. Scores are based on a weighted combination of four diagnostic sub-scores. Scores are reported in the range from 20 to SO.

72-80   Test-taker speaks and understands effortlessly at native speaker speeds, and can contribute readily to a native- paced discussion at length, maintaining the colloquial flow. Speech is completely fluent and intelligible; test-taker has consistent mastery of complex language structures.

63-71   Test-taker easily handles a wide variety of discourse and speaking styles, and can contribute to a native-paced discussion. Speech is fluent, smooth and intelligible; test-taker controls appropriate language structure for speaking about complex material.

46-62   Test-taker can handle many utterances using a variety of words and structures, and can follow and sometimes participate in a native-paced conversation. Pronunciation is generally intelligible; test-taker can express some composite information on familiar topics to a cooperative listener.

37-45   Test-taker can handle short utterances using common words and simple structures, but has difficulty following a native-paced conversation. Pronunciation may sometimes not be intelligible; test-taker speaks slowly and pauses, but can convey basic information to a cooperative listener.

28-36   Test-taker can manage some slow, short, isolated utterances, or spoken formulas, but has difficulty following any native conversation; test-taker may often pause to search for words and may be difficult to understand.

20-27   Test-taker has very limited speaking and listening skills in English.

Chapter 3

Defining Segments in the Canadian Literacy Market

As noted above, analysis of the ISRS data have been presented in two reports.

Initial findings from the ISRS study were published in *Learning Literacy in Canada: Evidence from the International Survey of Reading Skills* (Statistics Canada and HRSDC, 2007). This report included a summary market segmentation analysis that revealed the different types of adult learners that the battery of clinical reading assessments allows one to identify.

The market segmentation analysis contained in the Statistics Canada and HRSDC report was subsequently refined and extended in *Reading the Future: Planning to Meet Canada's Future Literacy Needs* published by the Canadian Council for Learning (CCL, 2008).

The Statistics Canada and HRSDC report revealed eight key findings, including:

- An estimated 8,090,000 have proficiency below Level 3 on the ALL prose literacy scales – of whom 6,170,000 chose to be tested in English and 1,920,000 of whom chose to be tested in French. These numbers define the size of the basic literacy market in Canada.[3]

- As predicted by theory and clinical evidence, performance on the component skills is closely related to the emergence of fluid and automatic reading, as defined by Level 3 prose literacy proficiency in both English and French.

- The performance of adults taking the reading components assessment in French differs considerably from those for adults who took the tests in English, differences that reflect a combination of fundamental linguistic and orthographic differences between the two languages and significant differences in the demographic, linguistic and educational characteristics between the two populations, most particularly the fact that the immigrants taking the tests in French were much more likely to have a mother tongue of French than their English test-taking peers.

- A statistical procedure known as Latent Class Analysis was used to detect groups that share common patterns of strength and weakness on the component measures. The analysis of patterns of strength and weakness in the reading component measures reveals the existence of four distinct groups of low skilled individuals as shown below. Box 2.1 below describes the basic approach.

	Latent Class A	Latent Class B	Latent Class C	Latent Class D
	Average proportion correct on component test			
Component				
Vocabulary	0.68	0.63	0.90	0.95
Real Word recognition	0.54	0.84	0.78	0.96
Pseudo-word recognition	0.26	0.59	0.54	0.79
Spelling	0.24	0.46	0.80	0.95
Digit Span	0.34	0.39	0.45	0.55

---

3. This assertion is not strictly true. HRSDC's Essential Skill Profiles confirm the fact that many jobs require Level 4 or better prose literacy skills. Similarly a shrinking fraction of jobs demand literacy skills at Levels 1 or 2. Given the fact that many workers in these occupations do not currently possess this level of skill suggests that a bigger market exists. This estimate also excludes adults living on Indian Reserves, inmates of institutions, full-time members of the military and residents of Canada's three Northern Territories, an exclusion of roughly 1.5% of the target population.

Box 3.1

How does latent class analysis work?

Individuals are organized into groups or classes based on their patterns of performance on the five component skills. More specifically, the scores of the five components skill tests are analyzed using Latent Class Analysis (LCA) methods (Lazarsfeld and Henry, 1968; Patterson, Dayton and Graubard, 2002). LCA is a statistical tool for clustering subjects based on categorical variables. This analysis yields a probabilistic classification for each survey participant, where the classes are represented by different tendencies to perform in a certain way (more formally, each class is characterized by its conditional response probabilities) in each of the five components. Latent class analysis identifies relatively homogeneous groups of learners that share common sets of learning needs. Latent classes can then be situated on the overall prose literacy scale and profiled demographically.

- Thought of in more traditional instructional terms these latent classes can be described in cognitive terms as follows:

Table 3.1

Summary of Decoding and Vocabulary Level by Latent Class

Latent Class	Print skills	Comprehension skills
A	Very limited	Limited
B	Limited	Limited
C	Limited	Adequate
D	Adequate	Adequate

Figure 3.1 below reveals how performance on the component reading measures differs by Latent Class.

Adults in Latent Class D outperform adults in other classes on every component reading measure.

Adults in Latent Class A score relatively poorly on all the component measures.

Adults in Latent Class B do relatively well in Real Word Recognition but score poorly on the other components.

Latent Class C does relatively well on the vocabulary measures and on the spelling test.

Figure 3.1

Average proportion correct scores on each component displayed separately for each latent class, ISRS, 2005
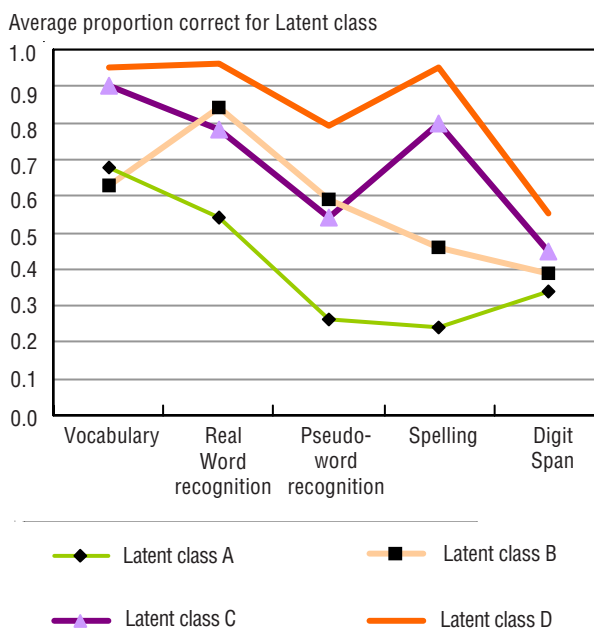
The following series of twelve charts reveal the variation in scores on each component test that exists for each latent class. The charts confirm that the latent classes are reasonably homogeneous.

Figure 3.2 A to F

L Box-whisker Plots of Component Scores by Latent Class, Canada

Posterior Mean PPVT   A

Posterior Mean Spelling   D

Posterior Mean Towre 1   B

Overall Phone Pass Score   E

Posterior Mean Towre 2   C

Repeat Accuracy Subscore   F
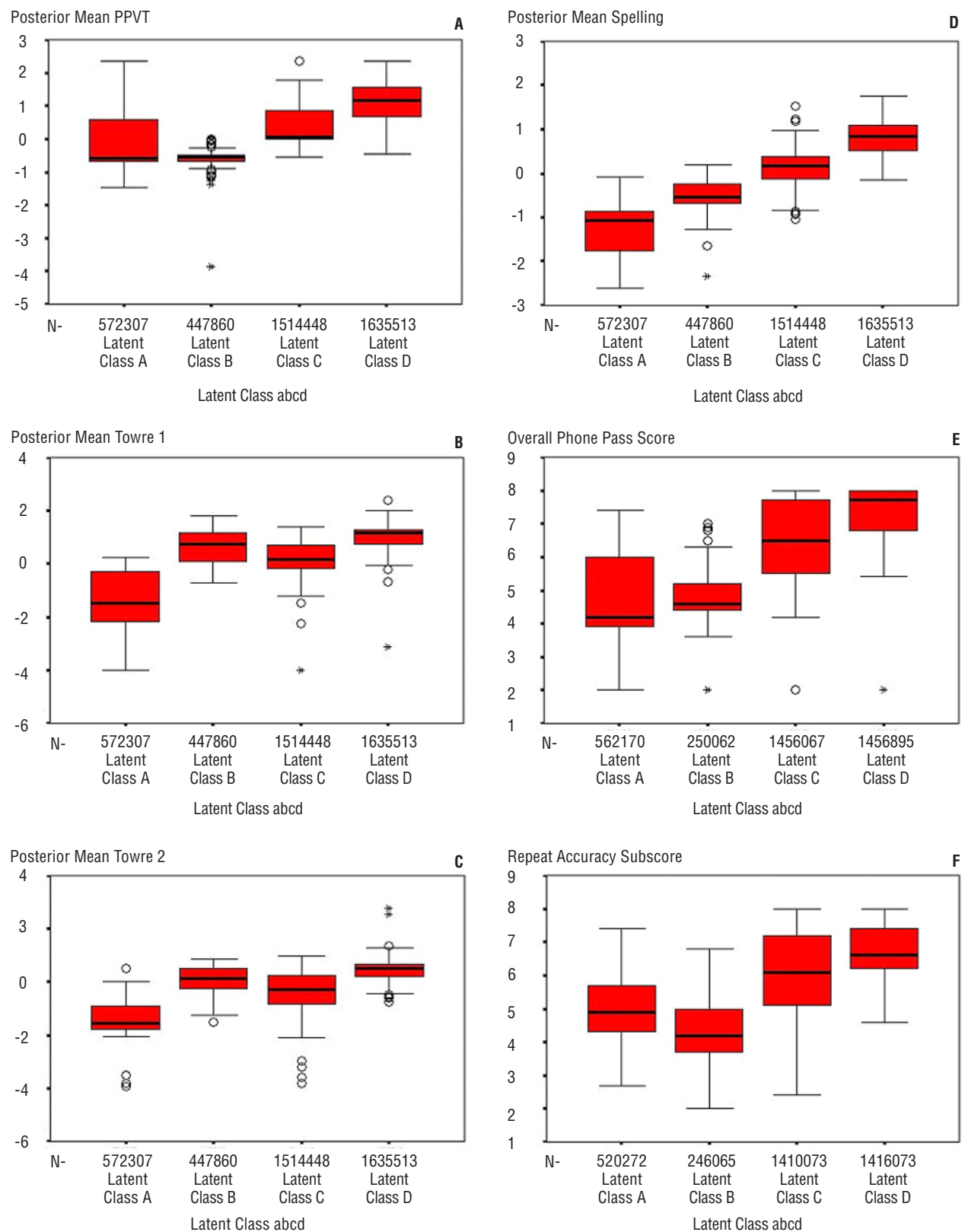
Source: ISRS, 2005.

Figure 3.2 G to J

L Box-whisker Plots of Component Scores by Latent Class, Canada

Reading Fluency Subscore

G

Listening Vocabulary Subscore

J

Repeat Fluency Subscore

H
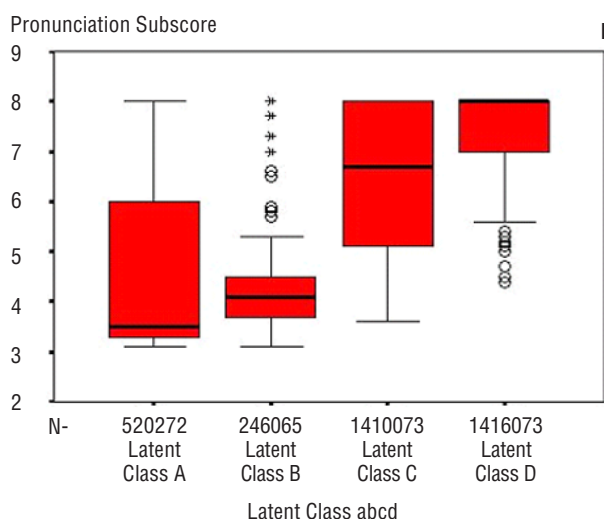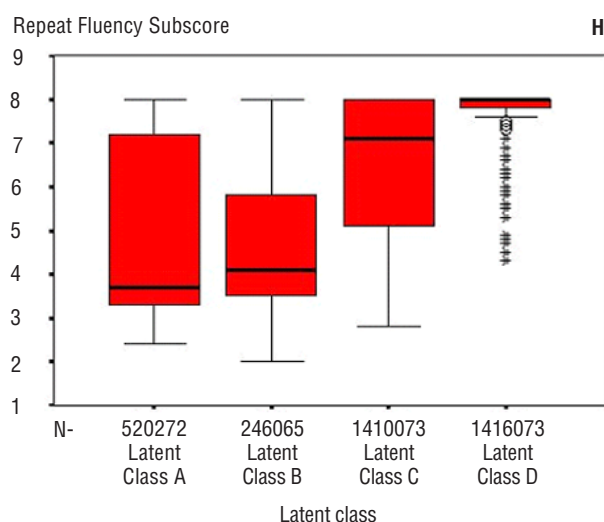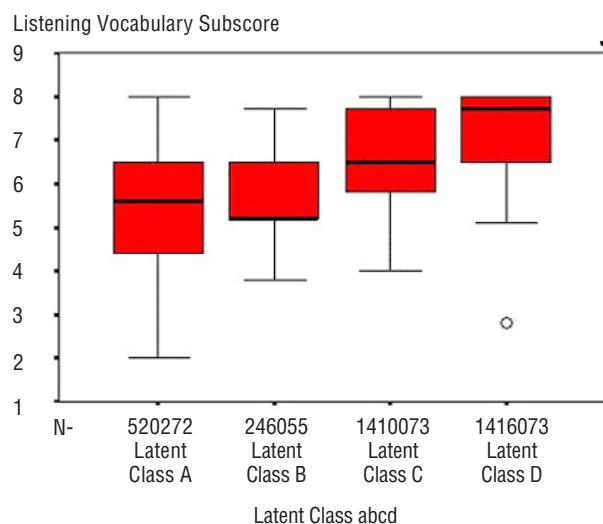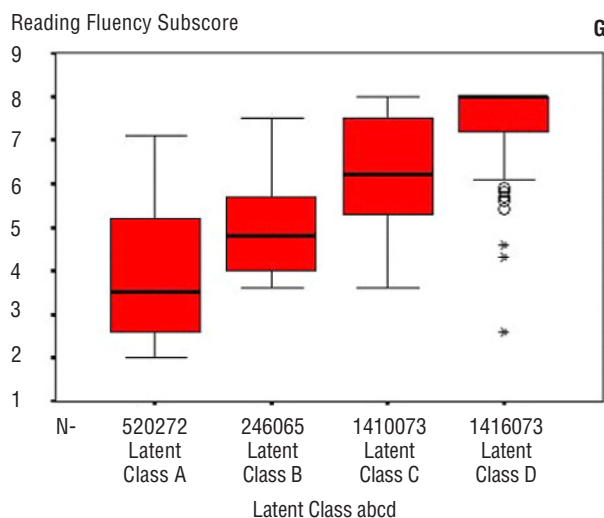
Source: ISRS, 2005.

The first two charts plot the distribution of prose literacy scores by latent class for English and French test takers respectively.

The third through twelfth charts show the distribution of scores on each of the component reading tests. The charts reveal that each market segment is characterized by a distinct pattern of component proficiency.

- Only a very small group of adult Canadians are what has been traditionally viewed as "illiterate". In reality, many adults, even in the lowest skilled classes, possess most of the required component skills, albeit at a level below that need to achieve Level 3. This fact implies that the cost of increasing skill levels is lower than has previously been estimated and belies the common perception that equates the literacy "problem" with adults who somehow failed to recognize the letters of the alphabet.

- Plain language initiatives, while necessary and desirable, are unlikely to afford access to information presented in print to three of the four classes identified above. Only the fourth, most skilled, class demonstrates the component reading skills needed to access even simple text.

Pronunciation Subscore

I

Source: ISRS, 2005.

- The fact that a significant fraction of adults' in each of these classes are immigrants to Canada is a cause for concern. These findings suggest that current investments are insufficient to release these adults full economic potential, or to guarantee full and equal access to Canada's social systems that non-immigrants take for granted.

To be efficient and effective, remedial instruction needs to be tailored to meet the needs of each of these groups - in terms of program content, structure, media and mode of instruction.

The CCL report refined the initial market segmentation analysis in two ways.

First, the latent classes were further sub-divided using a combination of immigrant status, mother tongue and educational attainment.

Second, each latent sub-class was further characterized using a set of variables known to influence program design and implementation.

Table 3.2 below summarizes the results of these analyses for English test takers.

Table 3.2

Cognitive profile of the English-language literacy market

Estimated number of potential adult learners and selected cognitive characteristics, by latent class, adults aged 16 and over resident in the provinces, 2003

Market Segment	Latent class	Prints skills	Meaning skills	English test takers			
				Average prose literacy score	Oral language score	Required score gain	Number of adults aged 16 +
Anglophone, indications of a reading disability	A1	Very Limited	Limited	Low Level 1 (197) 58.6	74	69	240,000
Non-Anglophone, no indication of a reading disability	A2	Very Limited	Limited	Mid-Level 1 (168)	41.8	100	379,000
Anglophone, indications of a reading disability	B1	Limited	Limited	Low Level 2 (214)	47.9	82	48,000
Non-Anglophone, vocabulary limited	B2	Limited	Limited	Low Level 2 (214)	48.9	71	430,000
Anglophone, Canadian-born and educated	C1	Limited	Adequate	Mid-Level 2 (241)	64.3	42	1,914,000
Reading but not well	D1	Adequate	Adequate	High Level 2 (259)	74.6	16	3,161,000
Total potential English-language learners							**6,171,000**

The CCL analysis revealed several additional insights, as follows:

- Both English Latent Class A and B can be broken down into two distinct sub-classes based upon whether the individual's mother tongue matches the language in which they were tested and whether there are indications of a reading disability, such as dyslexia.

- Based on the latent class analysis, the first five English market segments exhibit some degree of weakness in their component scores. Thus, adults in all five of these segments can all be thought of as still being in the process of learning to read.

- Only the last market segment, classified in English Latent Class D, appears to have no discernable component deficit. The Latent Classes were defined solely on adults' performance on the component measures and do not include any consideration of the strategic reading skills identified in the IALS and ALL framework (Statistics Canada, 2005). The component skills enable the use of strategic reading skills but do not assume them or require them. i.e., component skills are necessary, but not sufficient to reach Prose literacy Level 3. Even though the official definitions do not include it, the tasks in level 3 are much more likely to involve conditional

information. Tasks that involve conditional information are more complex cognitively because they require more information to keep organized and are more demanding linguistically because of the increasing presence of subordinate clauses. That is, the texts at level 3 begin to have lots of characteristics that are not often found in ordinary daily oral discourse, but which show up in educational oral discourse.

- It is likely that these adults are able to cope with most texts and tasks provided that they have had a chance to become familiar with them. Nevertheless this group will have difficulty coping with unfamiliar texts and tasks and has failed to master the skills that would place them at Level 3 on overall prose literacy scale. More specifically potential learners in English Latent Class D are unable to perform up to the 80% mastery threshold on the following tasks:

  - make literal or synonymous matches between the text and information given in the task,

  - make matches that require low levels of inference,

  - integrate information from dense or lengthy text that contains no organizational aids such as headings, or,

  - generate a response based on information that can be easily identified in the text.

- English Latent Class D is far the largest market segment, including 3,161,000 potential adult learners, or roughly half of the total number of potential English-language learners classified at Levels 1 and 2. This segment is 1.65 times the size of the next largest segment and is largely made up of Canadian-born and educated adults.

- English Latent Class B1 is the smallest market segment, including only 48,000 potential adult learners.

- The remaining English market segments range in size from 240,000 (A1), 379,000 (A2) and 430,000 (B2). While the majority of the potential learners in these segments are immigrants to Canada, a small proportion of them are aboriginal Canadians with a mother tongue other than English.

- The fact that the overwhelming majority of these latter segments are immigrants suggests that current language and literacy programs are not providing these adults with the literacy skills they need to support a rapid and successful social and economic integration.

The refined English latent classes can be summarized graphically below.

Figure 3.3

The distribution of English-language latent classes

Estimated number and proportion of adult learners, tested in English, by latent class, adults aged 16 and over resident in the provinces, 2003

Label		%	Number
A1	Very limited print skills, limited comprehension skills, English mother tongue	3.9	240,000
A2	Very limited print skills, limited comprehension skills, Non-English mother tongues	6.1	379,000
B1	Limited print skills, limited comprehension skills, English mother tongue	1.0	48,000
B2	Limited print skills, limited comprehension skills, Non-English mother tongues	7.0	430,000
C1	Limited print skills, adequate comprehension skills	31.0	1,914,000
D1	Adequate print skills, adequate comprehension skills	51.2	3,161,000
Total Potential Adult Learners tested in English		**100**	**6,171,000**

Source: ALL 2003, ISRS 2005

The initial CCL analyses defined English literacy market segments based solely upon the language in which the components' assessment was administered, their mother tongue and upon the patterns of strength and weakness shown in their test scores on the reading component tests.

Because the cognitive clusters described above are a necessary, but insufficient, basis for defining literacy market segments, or for identifying efficient and effective remedial programs that respond to their learning needs, the CCL analysis introduced a number of additional non-cognitive dimensions. The addition of these dimensions is important because of the influence that they exert on the structure, content, mode of instruction, and, by extension, on the efficiency, effectiveness and cost, of raising each group's skills to Level 3.

These non-cognitive dimensions include:

- Oral language proficiency, because weak oral language skills will reduce the efficiency and effectiveness of literacy instruction.

- Educational attainment, because of the impact it has on the level of effort required to raise literacy levels. Adults who are educated and literate in their own language require only second language instruction whereas adults who have yet to master literacy in their mother tongue require much more intensive training.

- Income, because of the impact it has on an individual's ability to self-finance their literacy upgrading.

- Employment status, because it can be argued that employers should bear the cost of literacy upgrading for their employees.

- Attitudes towards information and communication technologies, to gauge the degree to which upgrading might rely on computer-aided instruction.

- Age group, because average age will influence recruitment and retention costs and the return on investment because of the shorter period over the costs must be amortized.

- The presence of children in the home, because having children raises program costs, and lowers program efficiency but opens the possibility of applying cost-effective family literacy approaches.

- Self-perception of adequacy of skill levels, because it costs more to recruit and retain adults who feel their current skill levels are adequate.

The following figure shows the basic distribution of potential adult learners that were tested in French.

Figure 3.4

The distribution of French latent classes

Estimated number and proportion of adult learners, tested in French, by latent class, adults aged 16 and over resident in the provinces, 2003
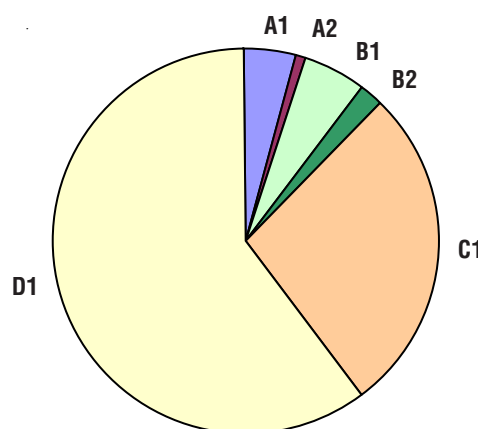
Label	%	Number
A1 Very limited print skills, limited comprehension skills, French mother tongue	4.5	87,000
A2 Very limited print skills, limited comprehension skills, Non-French mother tongues	0.8	16,000
B1 Limited print skills, limited comprehension skills, French mother tongue	5.3	103,000
B2 Limited print skills, limited comprehension skills, Non-French mother tongues	1.8	34,000
C1 Limited print skills, adequate comprehension skills	27.3	522,000
D1 Adequate print skills, adequate comprehension skills	60.3	1,158,000
Total Potential Adult Learners tested in French	**100.0**	**1,920,000**

Source: ALL 2003, ISRS 2005

The figure reveals several important facts, as follows:

- The estimated number of potential adult learners requiring instruction in French is 1,920,000.
- This number, while only 31 percent of the equivalent population in English, is roughly proportional to the Anglophone and Francophone populations of Canada.
- The largest French market segment is Class D, with 1,158,00 potential adult learners.
- The second largest French market segment, with 522,000 potential adult learners, is Class C.
- The third and fourth largest French market segments are Classes B1 and A1 with 103,000 and 87,000 respectively.

- The two remaining classes, B2 and A2, are tiny, containing 34,000 and 16,000 potential learners respectively.
- Fully 87 percent of potential adult learners requiring instruction in French are classified in Latent Classes C and D, 5 percent higher than the proportion requiring instruction in English.
- The two Latent sub-classes that are dominated by immigrants (A2 and B2) are relatively much smaller than in the English target population, representing an estimated 3 percent of potential learners versus 17 percent in English.

Table 3.3

A cognitive profile of the French-language literacy market

Estimated number of potential adult learners and selected cognitive characteristics, by latent class, adults aged 16 and over resident in the provinces, 2003

Market segment	Latent class	Print skills	Meaning skills	Average prose literacy	Average oral language score in French	Required score gains	Number of adults aged 16 +
				French test takers			
Francophone, indications of a reading disability	A1	Very limited	Limited	Prose score mid-level 1 (206)	59	69	87,000
Non-Francophone, no indication of a reading disability	A2	Very limited	Limited	Prose score low-level 1 (168)	-	107	16,000
Francophone, indications of a reading disability	B1	Limited	Limited	Prose score high-level 1 (214)	66.6	61	103,000
Non-Francophone, vocabulary limited	B2	Limited	Limited	Prose score high-level 1 (207)	-	67	34,000
Francophone, Canadian-educated	C1	Limited	Adequate	Prose score low-level 2 (241)	72	34	522,000
	D1	Adequate	Adequate	Prose score low level 2 (257)	72	18	1,158,000
Total potential French-language learners							**1,920,000**

The CCL report set out the structure of a proposed educational response for each of the groups of learners identified in the foregoing analysis.

The proposed responses are meant to represent what experts in the field judge to be current "best practice" and include recommendations related to:

- The content of instruction,
- The mode(s) of instruction, including the degree to which instruction can or should depend upon ICT's.
- The location of instruction
- The average duration of instruction
- Program intake and diagnostic processes
- Learner supports needed to enable learning
- Marketing and recruitment considerations
- The supports needed to retain students
- The tools needed to document learning outcomes

The chapter report also identified the system-level investments that will have to be made to support program delivery including:

- Support for educators
- Assessment tools

As any adult educator knows, the learning needs of individual adult learners within each market segment will vary considerably depending upon their personal circumstances and prior life experiences. Nevertheless, there is great value in ensuring a reasonable fit between the program offerings and the general needs of different groups of learners. Thus, the proposed "best practice" interventions were meant to be indicative rather than definitive. They were meant to ensure that all the institutional elements were in place to ensure success for all learners and to provide a means to derive first order approximations of the aggregate costs of raising each group of learners to prose literacy Level 3.

Detailed descriptions of the proposed "best practice" interventions are provided in the CCL report.

The following summary of the expert's recommendations is intended to provide readers with a sense of the diversity of the required program response.

Table 3.4 below summarizes key differences among the "best practice" program responses for each market segment.

Readers are reminded that the detailed "best practice" program responses should not be interpreted too literally. They are only a means to an end i.e. to arrive at first order approximations of the total cost of raising the various groups of learners to Level 3.

Table 3.4

Summary of "Best Practice" program responses to each market segment

Market segment	Estimated number of learners	Average contact hours of instruction	Average class size	Cost per student to raise to level 3 ($)	Individualized learning Plans	ICT supported instruction
English segments	**6,911,000**					
A1	268,000	375	5/15	2,877.92	Yes	No
A2	424,000	375	5/15	3,020.42	Yes	No
B1	54,000	350	5/15	2,635.04	Yes	No
B2	482,000	350	5/15	2,777.50	Yes	No
C1	2,144,000	75	20	340.63	No	Yes
D1	3,540,000	40	20	228.92	No	Yes
French segments	**2,150,000**					
A1	97,000	375	5/15	2,877.92	Yes	No
A2	18,000	375	5/15	3,020.42	Yes	No
B1	115,000	350	5/15	2,635.04	Yes	No
B2	39,000	350	5/15	2,777.50	Yes	No
C1	584,000	75	20	340.63	No	Yes
D1	1,297,000	40	20	228.92	No	Yes

Chapter 4

Estimating the Costs and Benefits of Releasing Canada's Economic Potential through Literacy Instruction

The previous chapter presented an overview of what experts judge to be the "best practice" program response to each group's learning needs.

This chapter builds on this analysis in two ways.

First, the chapter derives first order approximations of what it would cost to raise each group to prose literacy Level 3, the proficiency level judged necessary to ensure full and equal access to the global knowledge economy and to take full advantage of post-secondary education.

The costing model estimates the total cost of remediation, including both direct instructional costs and indirect costs of diagnosis, learner support, certification and administration.

Second, the chapter reflects on who should assume responsibility for making the investment. Each group of adult learners differs greatly in its ability to pay and this fact should be reflected in who funds the policy response.

4.1 The costing methods

The cost estimates were developed by a group of Canadian experts who are actively involved in delivering various sorts of remedial literacy programs. While every effort has been made to base these estimates in reality, the estimates should be taken as indicative of the required magnitude of investment, not as definitive.

As noted above the cost estimates are meant to reflect the average costs of bringing each group of learners to prose literacy Level 3. For groups with average skills at prose literacy Level 1, this involves estimating the cost of first raising the learner's skills to prose literacy Level 2 and then estimating the cost of raising the same learners to Level 3.

All cost estimates are based upon average costs that are thought to be reasonable approximations for the group in question. While the actual costs of delivering programs to each group are likely to vary considerably for specific groups of learners, the experts judge that the amounts allocated are sufficient, on average, to achieve the desired result.

When compared to IALSS, the ISRS study under estimates the total number of off-reserve adults aged 16 to 65 with Level 1 and 2 skills in Canada by roughly 12%. Thus, the estimated numbers of learners in each market segment derived from the ISRS have been adjusted upward so the totals from the two studies match.

The estimates of the size of market segments exclude residents of Indian reserves, inmates of various institutions and full-time members of the military. Although these groups only represent 0.5% of the total population aged 16 and over, they are more likely to have Level 1 or 2 prose literacy proficiency. As a result the total costs of solving Canada's literacy "problem" have been underestimated slightly.

The cost estimates for each group are derived in two stages.

First, the direct costs of instruction are estimated by multiplying the estimated average number of hours needed to raise learners to the next level by the estimate of the number of learners in the respective group. The model assumes a standard rate of pay for instructors of $35 per hour, the prevailing rate in programs delivered by Douglas College in their Foundations Program.

Readers should not take this as an endorsement of a college-based solution to Canada's literacy problems. The fact that this rate is considerably higher than many literacy instructors currently get paid means that the cost estimates presented in the report are on the high side, with the result that the estimated rates of return to literacy investments are conservative. At a minimum the $35 rate is high enough to attract and retain instructors of the requisite quality.

Second, the indirect costs of supporting instruction are estimated. Separate estimates are derived for:

- Recruitment costs
- Diagnostic costs
- Retention costs
- Certification costs
- Facilities costs
- Participant supplies
- Other infrastructure costs

Recruitment costs are those costs associated with securing participation in programs. Recruitment costs include marketing, outreach and basic program intake operations.

Diagnostic costs are those costs incurred in undertaking formative assessment to establish learning goals, learner needs and to establish baseline skill levels.

Retention costs represent those costs that are incurred to provide sufficient learner support to ensure retention to completion. These include funding to support personal contact throughout the program and for incidental expenses such as daycare, transportation, etc.

Certification costs are costs incurred at program exit to establish, through comparison to initial skill level, learning gain.

Facilities costs include things such as classroom rentals.

Participant supplies include instructional resources such as paper, pens, workbooks, etc.

Other infrastructure costs include institutional overheads.

As for the direct costs of instruction, indirect costs are estimated as averages that are judged to be sufficient overall. Clearly, the average costs mask considerable variation in what it would cost to offer programs to specific sub-groups of learners, including aboriginal Canadians.

No effort has been made to estimate the cost of training the instructors that will be needed to deliver the programs. We assume that these costs can be absorbed in the current post-secondary education budgets.

No estimates have been provided for the cost of developing and administering a system of instructor certification, nor for providing the general system supports such as the development of more efficient and effective curricula and delivery systems. Current federal and provincial budgets are judged to be sufficient for these purposes.

It should also be noted that these costs exclude the cost of any related language training. The ISRS study classified respondents into one of six groups based upon their assessed oral language proficiency. Average oral language proficiency scores for English segments C and D, and for French segments C, D and B1, fell in the highest two levels. Average scores for the other segments were considerably lower, suggesting a need for language training.

By way of reminder, the foregoing CCL analyses identified 6 groups of potential learners in each language.

4.2 The relative size of the literacy market segments

The following table provides a summary of the literacy market segments identified in the CCL analysis and the estimated cost of raising each segment to prose literacy level 3.

Table 4.1

Number of learners and average hours of remedial instruction by market segment, adults aged 16 and over, Canada 2003

Market segment	Number of potential learners[1]	Average hoursof instruction required to raise to level 3
English A1	268,000	375
English A2	424,000	375
English B1	54,000	350
English B2	482,000	350
English C1	2,144,000	75
English D1	3,540,000	40
Total Potential English-Language Learners and hours	**6, 911,000**	**669,051,725**
French A1	97,000	375
French A2	18,000	375
French B1	115,000	350
French B2	39,000	350
French C1	584,000	75
French D1	1,297,000	40
Total Potential French-language Learners and hours	**2,150,000**	**171,885,470**
Total Potential Learners and hours	**9,061,000**	**840,937,195**

1. The coverage of the ISRS study excluded roughly 12% of the estimated numbers of adults at Levels 1 and 2 derived from the IALSS study. The number of potential learners derived from the ISRS has been inflated by 12% to ensure that the cost-benefit analyses reflect the true magnitude of the potential literacy market.

Source: ISRS, 2005

Figure 4.1 provides a visual summary of how the English-speaking literacy market is segmented.

Segments in the English Canadian Literacy Market, 2003

Label		%	Number
A1	Male dropouts, reading disabled	4.0	240,000
A2	Immigrant women, little education	6.0	379,000
B1	Male, high school only	1.0	48,000
B2	Educated immigrant women	7.0	430,000
C1	Slight problems with decoding and comprehension	31.0	1,914,000
D1	No problems with mechanics of reading, lack skill to get to level 3	51.0	3,161,000
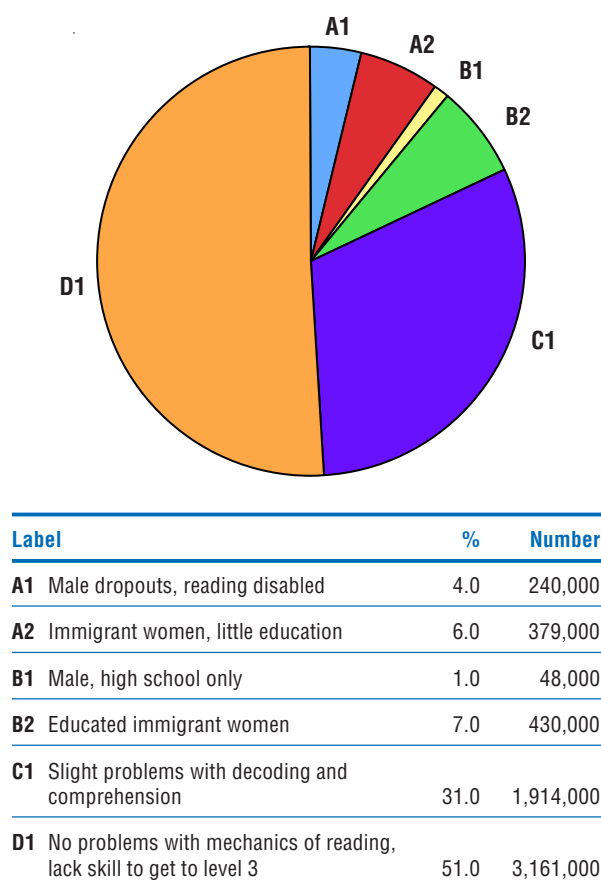
Source: IALSS 2002 and ISRS 2005.

The figure and the associated table reveals several important facts about the English literacy market, including:

- The market for English-language literacy instruction is large, including an estimated 6,911,000 potential learners aged 16 and over.

- By far the largest group of potential English learners, 3,540,000 adults, are classified in English Latent Class D1. This group of potential learners, representing over half (51%) of the entire English market is estimated to need only 40 hours of instruction to bring their skill level up to Level 3.

- The second largest group of English learners, classified in English Latent Class C1 includes an estimated 2,144,000 potential learners. This group, representing fully 31% of the English literacy market, also has very modest learning needs, requiring an estimated 75 hours of instruction to raise their skills to prose literacy Level 3.

- Together, these two groups represent 82% of the entire English literacy market. Few adult literacy programs are in place to serve these adults learning needs.

- The remaining segments in the English literacy market represent only 18% of the potential market but require significantly more hours of instruction. Most of the current literacy program offerings are designed for these groups.

- The third largest group of English learners, English Latent Class B2, includes 482,000 adults. Although roughly 1/7th the size of the largest group, this group is estimated to need double the number of hours of instruction.

- The fourth and fifth groups of English learners are classified in English Latent Classes A2 and A1, 424,000 and 268,000 adults respectively. Both these groups are estimated to need an average of 375 hours of instruction to bring them to prose literacy level 3.

- The two market segments that are dominated by immigrant women, A2 and B2, represent only 13% of the potential English literacy market.

- The final group of learners, classified as Latent Class B1, contains only 54,000 potential learners, each of whom is estimated to need 350 hours of instruction to bring them to prose level 3.

Figure 4.2 provides a visual summary of how the French-speaking literacy market in Canada is segmented.

Figure 4.2

Segments in the French Canadian Literacy market, 2003

Label		%
A1	Male dropouts, reading disabled	5.0
A2	Immigrant women, little education	1.0
B1	Male, high school only	5.0
B2	Educated immigrant women	2.0
C1	Slight problems with decoding and comprehension	27.0
D1	No problems with mechanics of reading, lack skill to get to Level 3	60.0

Source: IALSS 2002 and ISRS 2005.

The figure and the associated table reveal several important facts about the French literacy market in Canada, including:

- The market for French-language literacy instruction is large, including 2,150,000 potential learners aged 16 and over.
- The largest group of French-language learners, 1,297,000 adults, is classified in French Latent Class D1. This group of learners, representing 60% of the potential French literacy market, is estimated to need only 40 hours of instruction to bring their skill level up to Level 3.
- The second largest group of French learners, classified in French Latent Class C1, includes an estimated 584,000 potential learners. This group represents an estimated 27% of the potential French literacy market in Canada. This group has very modest learning needs, requiring an estimated 75 hours of instruction to raise their skills to prose literacy Level 3.

- Together, these two groups represent 87% of the entire French literacy market. Few adult literacy programs are in place to serve these adults' learning needs.
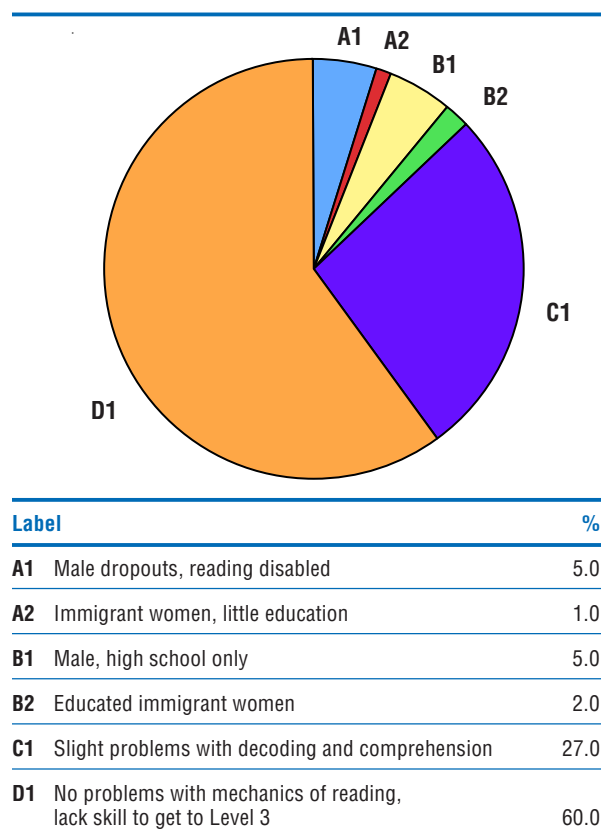- The remaining segments in the French literacy market represent only 13% of the potential market but require significantly more hours of instruction. Most of the current literacy program offerings are designed for these groups.
- The third largest group of French learners, French Latent Class B1, includes 115,000 adults. Although roughly 1/12th the size of the largest group, this group is estimated to need 350 hours of instruction.
- The fourth group of French learners, Latent Class A1 contains 97,000 adults and would require an average of 375 hours of instruction to bring them to prose literacy level 3.
- The final two groups of potential French-language learners are small containing only 18,000 (A2) and 39,000 (B2) adults respectively. These learners would need 375 and 150 hours of instruction respectively to bring them to prose level 3.
- The two market segments that are dominated by immigrant women, A2 and B2, represent only 3% of the potential French literacy market compared to 13% in the English market.

4.3   The cost of remediation

The results of the costing exercise are presented in Tables 4.2 and 4.3 below.

The tables reveal that the total cost of raising all adult Canadians to Prose literacy Level 3 is estimated to be **$6,400,975,510**.

This cost reflects **$5,072,477,731** for English-speaking segments and **$1,328,502,629** for Francophone instructional cost.

As expected the estimated total cost of remediation varies considerably for different groups of learners.

The four largest investments are needed to offer English-language programs to potential learners.

The largest investment, a total of **$1,337,877,443**, is required to raise the English-language Latent Class B2 group to Level 3. The size of this investment is the product of a relatively large number of learner hours and relatively high unit costs.

Table 4.2

Estimated direct, indirect and total costs of raising market segments to level 3

Initial Latent and description	Average prose cost	Average score gain	Target prose score class	Estimated number of score	Contact hours to raise direct to required	Instruction indirect	Instructional per student learners	Average class next level	Direct instructional	Estimated indirect cost/class	Total Cost/Student On line tests	Total Cost On line tests	Cost per student	Cost per student
				number	hours	$	$	%	cost/hour	$	$	$	$	$
Component tests administered in English														
A1														
English mother tongue	206	20	A1 to Level 2	268,303	200	35	7,000	5	1,400	375,624,200	179,987,172	555,611,372	2,070.84	
indications of reading disability		49	A1 to Level 3	268,303	175	35	6,125	15	408	109,557,058	106,986,094	216,543,153	807.08	2,877.92
A2														
Non-English mother tongue	168	58	A2 to Level 2	424,035	225	35	7,875	5	1,575	667,855,125	313,255,856	981,110,981	2,313.75	
no indication of reading disability		49	A2 to Level 3	424,035	150	35	5,250	15	350	148,412,250	151,239,150	299,651,400	706.67	3,020.42
Total direct cost of raising latent class A to Level 3										**1,301,448,633**	**751,468,272**	**2,052,916,906**		
B1														
English mother tongue	214	12	B1 to Level 2	53,538	175	35	6,125	5	1,225	65,584,050	32,279,457	97,863,507	1,827.93	
indications of reading disability		49	B1 to Level 3	53,538	175	35	6,125	15	408	21,861,350	21,349,916	43,211,266	807.11	2,635.04
B2														
Non-English mother tongue	207	19	B2 to Level 2	481,687	200	35	7,000	5	1,400	674,361,800	323,132,560	997,494,360	2,070.84	
		49	B2 to Level 3	481,687	150	35	5,250	15	350	168,590,450	171,802,633	340,393,083	706.67	2,777.50
Total direct cost of raising Latent class B to Level 3										**930,397,650**	**548,564,565**	**1,478,962,215**		
C1														
Employed workers	241	34	C1 to Level 3	2,143,658	75	35	2,625	20	131	281,355,113	448,828,482	730,183,594	340.63	
Total direct cost of raising Latent class C to Level 3										**281,355,113**	**448,828,482**	**730,183,594**		
D1														
No components problem	257	18	D1 to Level 3	3,540,197	40	35	1,400	20	70	247,813,790	562,596,377	810,410,167	228.92	
Total direct cost of raising Latent class D to Level 3										**247,813,790**	**562,596,377**	**810,410,167**	**733.93**	
Total direct cost of raising all Level 1 and 2's to Level 3										**2,761,015,186**	**2,311,457,695**	**5,072,472,881**		
Total number of learners English				**6,911,418**										
Components tests administered in French														
A1														
French mother tongue	206	20	A1 to Level 2	97,362	200	35.00	7,000	5	1,400.00	136,306,800	44,741,952	181,048,752	1,859.54	
indications of reading disability		49	A1 to Level 3	97,362	175	$ 35.00	6,125	15	408.33	39,756,150	32,761,397	72,517,547	744.82	2,604.37

Table 4.2 concluded
Estimated direct, indirect and total costs of raising market segments to level 3

Initial Latent and description	Average prose cost	Average score gain	Target prose score class	Estimated number of score	Contact hours to raise direct to required	Instruction indirect	Instructional per student learners	Average class next level	Direct instructional	Estimated indirect cost/class	Total Cost/Student On line tests	Total Cost On line tests	Cost per student	Cost per student
				number	hours	$	$	%	cost/hour	$	$	$	$	$
A2 Non-french mother tongue no indication of reading disability	168	58	A2 to Level 2	17,566	225	35.00	7,875	5	1,575.00	27,666,450	23,645,433	51,311,883	2,921.09	
		49	A2 to Level 3	17,566	150	35.00	5,250	15	350.00	6,148,100	20,550,949	26,699,049	1,519.93	4,441.02
Total direct cost of raising Latent class A to Level 3										209,877,500	121,699,731	331,577,231		
B1 French mother tongue indications of reading disability	214	12	B1 to Level 2	114,871	175	35.00	6,125	5	1,225.00	140,716,975	38,707,523	179,424,498	1,561.97	
		49	B1 to Level 3	114,871	175	36.00	6,300	15	420.00	48,245,820	28,062,377	76,308,197	664.29	2,226.26
B2 Non-french mother tongue	207	19	B2 to Level 2	38,554	200	35.00	7,000	5	1,400.00	53,975,600	32,891,060	86,866,660	2,253.12	
		49	B2 to Level 3	38,554	150	36.00	5,400	15	360.00	13,879,440	27,176,686	41,056,126	1,064.90	3,318.02
Total direct cost of raising Latent class B to Level 3										256,817,835	126,837,647	383,655,482		
C1 Employed workers	241	34	C1 to Level 3	584,434	75	35.00	2,625	20	131.25	76,706,963	163,195,556	239,902,518	410.49	
Total direct cost of raising Latent class C to Level 3										76,706,963	163,195,556	239,902,518		
D1 No components problem	257	18	D1 to Level 3	1,297,070	40	35.00	1,400	20	70.00	90,794,900	282,572,498	373,367,398	$287.85	
Total direct cost of raising Latent class D to Level 3										90,794,900	282,572,498	373,367,398		
Total direct cost of raising all Level 1 and 2's to Level 3										634,197,198	694,305,432	1,328,502,629	617.95	
Total number of learners French				2,149,857										
Total direct cost English										2,761,015,186	2,311,457,695	5,072,472,881		
Total direct cost French										634,197,198	694,305,432	1,328,502,629		
Total learners Canada				9,061,275					Total direct cost Canada	3,395,212,383	3,005,763,127	6,400,975,510		
Per person													706.41	

Table 4.3

Estimated indirect costs associated with raising market segments to level 3

Initial latent and description Class	Indirect costs ($)							
	Recruitment	Initial testing on-line	Retention	Final testing on-line	Facility costs	Participant supplies	Other infrastructure costs	Total indirect cost on-line tests
Component tests administered in English								
A1								
English mother tongue	9,390,605	5,366,060	14,085,908	5,366,060	71,548,000	38,456,763	35,773,776	179,987,172
indications of reading disability	3,130,202	5,366,060	14,085,908	5,366,060	33,910,771	33,649,668	11,477,426	106,986,094
A2								
Non-English mother tongue	14,841,225	8,480,700	22,261,838	8,480,700	127,210,500	68,375,644	63,605,250	313,255,856
no indication of reading disability	4,947,075	8,480,700	22,261,838	8,480,700	45,937,125	45,583,763	15,547,950	151,239,150
	32,309,107	**27,693,520**	**72,695,490**	**27,693,520**	**278,606,396**	**186,065,838**	**126,404,402**	
Total indirect cost of raising Latent class A to Level 3								**751,468,272**
B1								
English mother tongue	1,873,830	1,070,760	2,810,745	1,070,760	12,492,667	6,714,558	6,246,137	32,279,457
indications of reading disability	624,610	1,070,760	2,810,745	1,070,760	6,768,125	6,714,558	2,290,358	21,349,916
B2								
Non-English mother tongue	16,859,045	9,633,740	25,288,568	9,633,740	128,450,667	69,041,803	64,224,997	323,132,560
	5,619,682	9,633,740	25,288,568	9,633,740	52,183,625	51,781,353	17,661,926	171,802,633
	24,977,167	**21,409,000**	**56,198,625**	**21,409,000**	**199,895,083**	**134,252,271**	**90,423,419**	
Total indirect cost of raising Latent class B to Level 3								**548,564,565**
C1								
Employed workers	18,757,008	42,873,160	112,542,045	42,873,160	87,086,188	115,221,618	29,475,304	448,828,482
D1								
No components problem	18,757,008	42,873,160	112,542,045	42,873,160	87,086,188	115,221,618	29,475,304	
Total indirect cost of raising Latent class C to Level 3								**448,828,482**
	30,976,724	**70,803,940**	**185,860,343**	**70,803,940**	**76,704,333**	**101,485,647**	**25,961,450**	**562,596,377**
	30,976,724	**70,803,940**	**185,860,343**	**70,803,940**	**76,704,333**	**101,485,647**	**25,961,450**	
Total Indirect cost of raising Latent class D to Level 3								**562,596,377**
	107,020,005	**162,779,620**	**427,296,503**	**162,779,620**	**642,292,000**	**537,025,373**	**272,264,575**	
Total indirect cost								**2,311,457,695**
Components tests administered in French								
A1								
French mother tongue	3,407,670	5,366,060	5,111,505	5,366,060	584,160	13,955,220	10,951,277	44,741,952
indications of reading disability	1,135,890	5,366,060	5,111,505	5,366,060	361,641	12,210,818	3,209,423	32,761,397
A2								
Non-French mother tongue	614,810	8,480,700	922,215	8,480,700	93,680	2,832,518	2,220,810	23,645,433
no indication of reading disability	204,937	8,480,700	922,215	8,480,700	76,115	1,888,345	497,937	20,550,949
	5,363,307	**27,693,520**	**12,067,440**	**27,693,520**	**1,115,596**	**30,886,900**	**16,879,448**	
Total Indirect cost of raising Latent class A to Level 3								**121,699,731**
B1								
French mother tongue	4,020,485	1,070,760	6,030,728	1,070,760	787,680	14,406,738	11,320,372	38,707,523
indications of reading disability	1,340,162	1,070,760	6,030,728	1,070,760	262,560	14,406,738	3,880,670	28,062,377
B2								
Non-French mother tongue	1,349,390	9,633,740	2,024,085	9,633,740	375,911	5,526,073	4,348,121	32,891,060
	449,797	9,633,740	2,024,085	9,633,740	167,050	4,144,555	1,123,719	27,176,686
	7,159,833	**21,409,000**	**16,109,625**	**21,409,000**	**1,593,201**	**38,484,104**	**20,672,883**	
Total indirect cost of raising Latent class B to Level 3								**126,837,647**
C1								
Employed workers	5,113,798	42,873,160	30,682,785	42,873,160	3,798,860	31,413,328	6,440,466	163,195,556
	5,113,798	**42,873,160**	**30,682,785**	**42,873,160**	**3,798,860**	**31,413,328**	**6,440,466**	
Total indirect cost of raising Latent class C to Level 3								**163,195,556**
D1								
No components problem	11,349,363	70,803,940	68,096,175	70,803,940	15,808,163	37,182,673	8,528,245	282,572,498
	11,349,363	**70,803,940**	**68,096,175**	**70,803,940**	**15,808,163**	**37,182,673**	**8,528,245**	
Total indirect cost of raising Latent class D to Level 3								**282,572,498**
	28,986,300	**162,779,620**	**126,956,025**	**162,779,620**	**22,315,820**	**137,967,005**	**52,521,041**	
Total indirect cost								**694,305,432**
Total indirect cost English								**2,311,457,695**
Total indirect cost French								**694,305,432**
Total indirect cost Canada								**3,005,763,127**

The second largest investment, a total of **$1,280,762,381**, is required to raise English-language Class A2 to Level 3.

The third largest investment - **$810,410,167** - is needed to raise English-language Latent Class D to Prose literacy Level 3 group. This is the product of large numbers but low unit costs per participant.
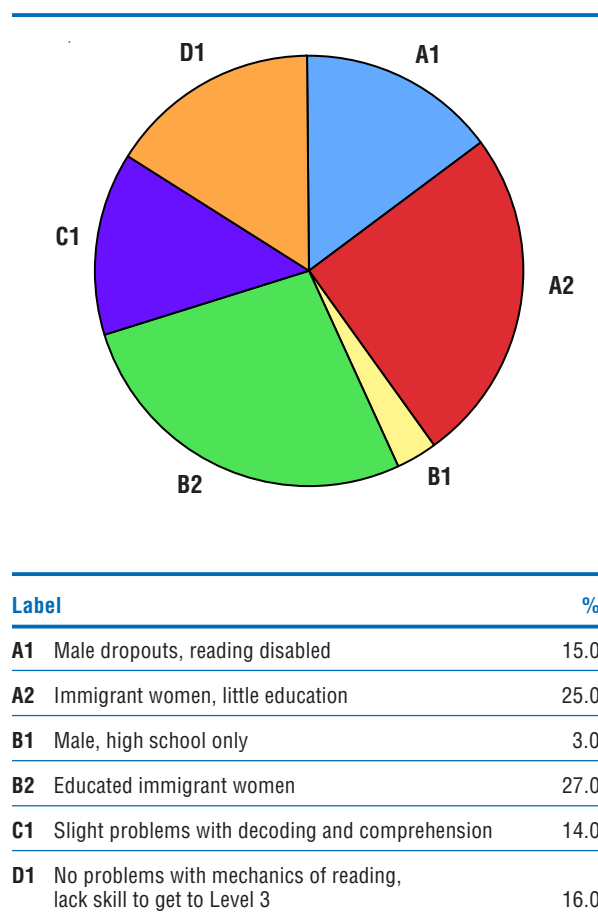
The fourth largest investment - **$772,154,524** – would be needed to remedy English-language Latent Class A1.

English Class C would require an investment of **$730,183,594** and Class B1 of **$141,074,772**.

Figure 4.3 provides a visual summary of the size of the English market in Canada judged in terms of what it would cost to raise each segment to prose literacy Level 3.

Figure 4.3

The size of the English Literacy market by market segment based on the estimated cost of raising all potential learners to prose Literacy Level 3, 2003

Label		%
A1	Male dropouts, reading disabled	15.0
A2	Immigrant women, little education	25.0
B1	Male, high school only	3.0
B2	Educated immigrant women	27.0
C1	Slight problems with decoding and comprehension	14.0
D1	No problems with mechanics of reading, lack skill to get to Level 3	16.0

The figure reveals several striking findings, including:

- The distribution of English market segments by cost of remediation is far more balanced than the comparable distribution by number of potential learners.
- Segment D1 includes 51% of the potential English learners but represents only 16% of the potential cost of remediation, a fact that reflects the low unit cost of raising them to Level 3.
- Similarly, English Segment C1 includes 31% of potential learners but represents only 14% of the estimated costs of remediation.
- Strikingly, English segments A2 and B2, the two classes that are dominated by immigrant women, include only 13% of the potential English learners but account for an estimated 52% of the estimated costs of literacy remediation. The oral language proficiency scores of these two groups are also low, a fact that suggests a need for remedial language training. The costs for such training have not been included in the cost estimates.

Investments needed to offer French-language programs include:

$373,367,398 is needed to offer services to French-language Class D adults.

$255,732,695 would be required to offer services to French language Class B1 adults.

$253,562,2799 is needed to serve French-language Class A1.

$239,902,518 is needed for French language Class C.
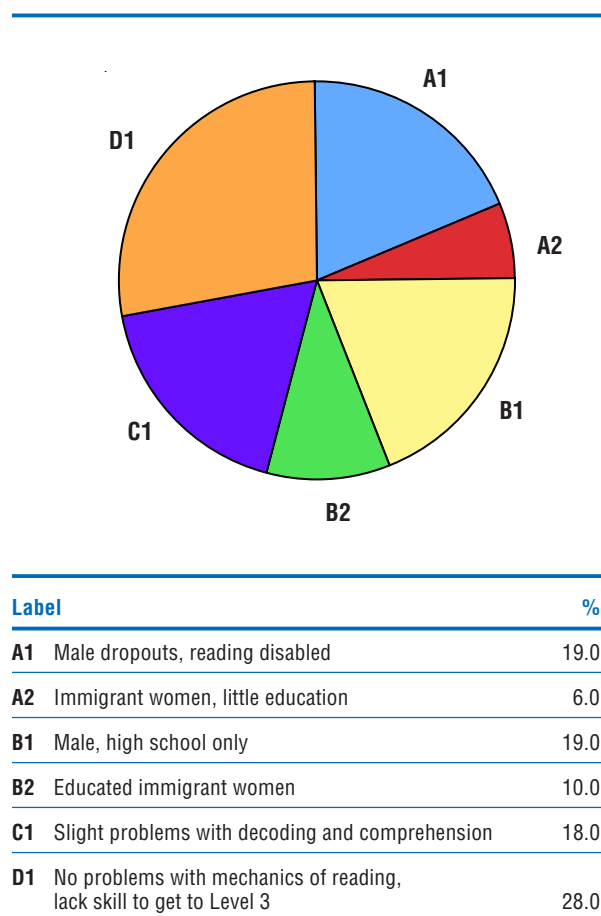
$127,922,786 would be enough to offer Class B2 French language services.

$78,010,932 is required for French Class A2 instruction.

Figure 4.4 provides a visual summary of the size of the French market in Canada judged in terms of what it would cost to raise each segment to prose literacy Level 3.

Figure 4.4

The size of the French Literacy market by market segment based on the estimated cost of raising all potential learners to prose literacy Level 3, 2003

Label		%
A1	Male dropouts, reading disabled	19.0
A2	Immigrant women, little education	6.0
B1	Male, high school only	19.0
B2	Educated immigrant women	10.0
C1	Slight problems with decoding and comprehension	18.0
D1	No problems with mechanics of reading, lack skill to get to Level 3	28.0

The figure reveals several striking findings, including:

- The distribution of French market segments by cost of remediation is far more balanced than the comparable distribution by number of potential learners.

- Segment D1 includes 60% of the potential French learners but represents only 28% of the potential cost of remediation, a fact that reflects the low unit cost of raising them to Level 3.

- Similarly, French Segment C1 includes 27% of potential learners but represents only 18% of the estimated costs of remediation.

- Strikingly, French segments A2 and B2, the two classes that are dominated by immigrant women, include only 3% of the potential French learners but account for an estimated 16% of the estimated costs of remediation.

Taken together, the segmentation analysis of the English and French literacy markets offers important information for both organizations in the literacy industry and government policy makers.

The fact that most of the potential learners in the Canadian literacy market are in segments that currently receive little attention from literacy programs is troubling. The misalignment between potential demand and the supply of literacy programs suggests a market in failure of the sort that only government can correct. Whatever the instruments chosen – from social marketing to raise consumer awareness or to funding the delivery of literacy programs – government has a role to play.

Further, the fact that the distribution of market segments by potential learners differs from the distribution by estimated cost of remediation matters to policy.

The relatively low unit costs of raising segments C1 and D1 to prose literacy Level 3 suggest that individuals and employers should be able to bear this cost, either directly or indirectly.

The fact that over half (52%) of the estimated cost of remediation in English segments is associated with the two segments that are dominated by immigrant women suggests a clear role for government in proving the funds needed to raise their literacy levels. Previous research has shown that most of these potential learners are working in urban areas, predominantly in small firms that are unlikely to fund literacy upgrading, and thatfinding adds to this argument (CCL, 2008).

4.4 Estimating the benefits of remediation

The relationship of literacy scores to individual and macro-economic outcomes suggests that some proportion of the costs of bringing all adult Canadians to prose literacy Level 3 will be offset by increases in productivity that are passed along to workers in the form of higher incidences of annual employment, more months worked per year, fewer hours worked per month and higher wages.

Two approaches were used to derive first order approximations of the likely economic benefits that would be precipitated by a literacy investment of the proposed magnitude:

- Propensity matching to estimate the economic and health benefits at the individual level

- Cost-benefit modeling to estimate the net economic benefits at the macro-economic level

The first approach yields aggregate estimates of the direct economic benefits likely to be precipitated by an increase in literacy skill if the economy were able to absorb all of the newly created skill as it became available.

The second approach yields aggregate estimates of the net economic benefit of an increase in literacy skill that assume the long-term relationship between literacy skill and GDP growth.

Propensity matched estimates of economic benefits

Propensity matching was employed to impute likely distributions of the incidence of employment, weeks worked, wage rates and physical and mental health for adults assuming that adults with Level 1 and 2 skills could, through instruction, be raised to Level 3.

Propensity matching allows one to overcome the problem that adults currently at Levels 1 and 2 differ in many respects other than their skill level from their peers currently at Level 3. The propensity matching approach ensures that the estimates of change are derived from a sample of workers that are, for all intents and purposes, identical to their less skilled peers.

Methods used in Propensity Matching

The strategy used to assess the potential impact of raising the literacy scores of adults with Level 1 literacy scores to Level 3, or from Level 2 to level 3, is propensity score matching. Typically this technique is used when one wants to estimate *treatment* effects in an observational study, but no systematic method or experimental design was used to maintain a control group (Dehejia and Wahba 2002). The underlying question when comparing treatments is whether individuals would do better with treatment A than they would with treatment B; however, it is practically and theoretically impossible to give people both treatments and then compare their results (Rudner and Peyton 2006). The idea underlying propensity matching is to create a pseudo control group of individuals who are similar in many respects to the treatment group. The strategy is to estimate for every individual in the sample a "propensity score", which is the probability that he or she would

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have been treated based on his or her pre-treatment variables. Propensity score matching is a refined approach to a matched-pairs design (Rosenbaum and Rubin 1983; Rosenbaum and Rubin 1985; Rubin 1997; D'Agostino 1998; Hong and Raudenbush 2005).

In the current case there are no individuals who have received a treatment. Rather, the current analysis is a "thought experiment" that derives estimates of the economic and health outcomes that would be precipitated if adults with level 1 skills, or level 2 skills, were to upgrade their skills to level 3, while holding all other factors constant. The estimates were derived as follows:

(1) logistic regression was used to estimate the propensity of an adult being at level 1 versus level 3, given a set of covariates known to be related to adult literacy scores. The data were stratified by province and territory, with a separate logistic model estimated for each province and territory. The model included the following covariates:

a. Age of respondent

b. Sex of respondent

c. Level of education of respondent

d. Area characteristics of the respondent's dissemination area:

i. Socioeconomic Status (SES). A statistical composite developed by KSI Research International Inc. derived from measures of occupational status, income, adult unemployment rate, and level of education.

ii. First Nations and Metis: Three separate measures denoting percent of families that are of aboriginal origin, Metis, or Inuit.

iii. Transience: the percentage of families that had moved in the previous five years;

iv. Immigration status: percentage of families that had immigrated between 1991 and 2001.

(2) The adults with Level 1 and level 3 skills were then ordered by their propensity score. The aim was to achieve the best "match" among level 3 adults for each adult with level 1 skills. The preferred approach is to find the "nearest neighbour", which is practical when one has a large reservoir of control group cases from which to choose. In the current case, however, the number of cases with Level 1 scores was relatively large compared with the potential reservoir Level 3 cases. Therefore we used a technique called "calliper matching". With calliper matching one chooses a match for a target individual (Level 1) by selecting a

person at random from all potential reservoir cases (level 3) that have a propensity score within a given range of the target person's propensity score. The range was set to be a probability of plus or minus 0.05 from the target person. The matching program therefore considers the propensity for the first level 1 individual to be in level 1 – for example, say it is 0.22 – and then identifies all level 3 individuals within a range of 0.05 probability, that is between 0.17 and 0.27 in this case, and finally selects a level 3 individual at random from this group of near neighbours. Because of the relatively small number of adults in the reservoir compared with the pseudo-treatment group, matches were selected with replacement. In the majority of cases there was a one-to-one match.

(3) This procedure was conducted 26 times (one for each province and territory, and with level 1 adults matched with level 3 adults, and level 2 adults matched with level 3 adults.

(4) The elegance of propensity matching is that the "treatment effects" are simply the difference between average treatment and control scores. The analysis examined the differences between level 1 adults and their level 3 matches for the following outcome variables:

Median wages per hour (dollars)

Months worked per year (months)

Percent employed (%)

Poor physical health (% scoring below the 20th percentile of the PCS measure of self-reported health)

Poor mental health (% scoring below the 20th percentile of the MCS measure of self-reported health)

Some key references for propensity matching

D'Agostino, R.B. (1998). Propensity Score Methods for Bias Reduction in the Comparison of a Treatment to a non-randomized control group. *Stat Med* 17(19), 2265-2281.

Dehejia R. & Wahba, S. (2002). Propensity score-matching methods for non-experi-mental causal studies. *The Review of Economics and Statistics*, vol. 84(1), 151-161.

Hong, G. & Raudenbush, S.W. (2005) Effects of Kindergarten Retention Policy on Children's Cognitive Growth in Reading and Mathematics, *Educational Evaluation and Policy Analysis,* 27(3), 205–224.

Rosenbaum, P., and D. Rubin, "The Central Role of the Propensity Score in Observational Studies for Causal Effects," *Biometrika* 70:1 (April 1983), 41–55.

Rosenbaum, P., and D. Rubin,, "Constructing a Control Group Using Multivariate Matched Sampling Methods that Incorporate the Propensity," *American Statistician* 39:1 (February 1985a), 33–38.

Rubin, D. "Matching to Remove Bias in Observational Studies," *Biometrics* 29 (March 1973), 159–183.

Rubin, D. "Assignment to a Treatment Group on the Basis of a Covariate," *Journal of Educational Statistics* 2:1 (Spring 1977), 1–26.

Rubin, D. "Using Multivariate Matched Sampling and Regression Adjustment to Control Bias in Observation Studies," *Journal of the American Statistical Association* 74:366 (June 1979), 318–328.

Rudner, L. M. & Peyton J. (2006). Consider Propensity Scores to Compare Treatments. *Practical Assessment Research & Evaluation.* 11(9).

The propensity matched values were then used to derive aggregate estimates of the increase in labour income that would be associated with raising all adult Canadians to Level 3, and the associated increases in federal and provincial income taxes, and attendant decreases in social assistance and employment insurance payments, that would be precipitated by the investment. These estimates, computed separately for each province and territory and aggregated to the national level, are presented below.

Tables 4.4 and 4.5 below provide estimates of the forecast increases in aggregate earnings and tax revenue based upon the incidence of employment, weeks worked hours worked and average wage rates for Canada, the provinces and territories, pre and post-instruction, for moving adults from Levels 1 and 2 to Level 3.

Table 4.4 Average Incidence of Employment, Weeks Worked, Hours worked and Wage Rates and Estimated Increase in Labour Income and Tax revenue, for Canada and provinces and territories, 2005.

Table 4.4

Estimates of the increase in earnings and income taxes associated with moving adults with Level 1 prose literacy skills to Level 3, Canada and the jurisdictions 2003

| | Actual employment and earnings of adults at prose literacy Level 1 aged 16 and over | | | | | | | | | | | | | |
| Jurisdiction | Population level 1 | Incidence of employment | Average months worked | Average hours worked per month | Incidence of welfare | Incidence of EI | Hourly wage rate (approx.) | Average earnings for those with earnings | Average earnings including those with no earnings | Aggregate earnings level 1 | Average federal and provincial income tax rates | Current income tax revenue for level 1 | Number with welfare income | Number with EI income |
	number	%	months	hours	%	%	dollars	$ millions	$ millions	$ millions	%	$ millions	number	number
N.L.	68,041	53	7.1	187	27	25	14	20,675	11,057	752	13	100	19,000	17,000
P.E.I.	13,248	81	8.2	184	43	13	11	18,143	14,678	194	13	$26	6,000	2,000
N.S.	72,942	54	8.5	158	16	16	13	21,950	11,930	870	13	115	12,000	12,000
N.B.	87,920	71	8.5	170	28	11	17	23,888	16,934	1,489	14	208	25,000	10,000
Que.	800,749	63	9.0	157	14	21	18	26,074	16,488	13,203	14	1,844	112,000	164,000
Ont.	1,348,495	65	9.6	165	6	9	20	33,611	21,937	29,582	16	4,690	83,000	120,000
Man.	93,182	66	9.6	162	9	16	18	29,052	19,125	1,782	15	268	8,000	15,000
Sask.	46,276	70	8.4	178	17	16	15	25,111	17,541	812	14	113	8,000	7,000
Alta.	212,393	79	9.1	161	8	12	18	26,395	20,740	4,405	14	615	17,000	26,000
B.C.	407,495	54	7.9	165	9	18	15	22,632	12,273	5,001	14	699	38,000	73,000
Yukon	1,717	75	7.7	149	13	27	21	25,152	18,936	$33	14	5	-	-
N.W.T.	4,051	72	7.4	164	11	8	22	28,249	20,314	$82	15	12	-	-
Nunavut	5,389	68	7.7	161	10	36	20	22,731	15,429	$83	14	12	1,000	2,000
Canada	**3,161,899**	**64**	**9.0**	**163**	**10**	**14**	**18**	**28,503**	**18,254**	**58,288**		**8,708**	**329,000**	**448,000**

| | Projected employment and earnings of adults at prose literacy Level 1 who move to Level 3 aged 16 and over | | | | | | | | | | | | | |
| Jurisdiction | Population level 1 | Incidence of employment | Average months worked | Average hours worked per month | Incidence of welfare (at level 3) | Incidence of EI (at level 3) | Average wage rate | Average earnings for those with earnings | Average earnings including those with no earnings | Aggregate earnings level 1's promoted to 3 | Average federal and provincial income tax rates | Income tax revenue for level 1 at level 3 literacy | Number with welfare income | Number with EI income |
	number	%	months	hours	%	%	dollars	$ millions	$ millions	$ millions	%	$ millions	number	number
N.L.	68,041	78	8.4	186.2	21	4	15.20	26,373	20,494	1,394	14	195	14,000	3,000
P.E.I.	13,248	79	8.3	176.1	22	4	13.06	20,227	16,043	213	13	$28	3,000	1,000
N.S.	72,942	61	8.0	149.7	16	3	15.67	22,916	14,030	1,023	14	143	12,000	2,000
N.B.	87,920	88	7.9	154.0	14	2	20.38	23,504	20,687	1,819	14	254	12,000	1,000
Que.	800,749	66	9.8	168.5	12	3	22.14	37,973	24,915	19,951	17	3,430	97,000	25,000
Ont.	1,348,495	83	9.4	161.6	7	1	20.11	33,157	27,500	37,083	16	5,880	95,000	12,000
Man.	93,182	84	9.9	160.6	10	3	22.05	36,004	30,337	2,827	16	448	9,000	3,000
Sask.	46,276	94	9.4	187.7	6	3	35.12	68,927	64,726	2,995	20	587	3,000	1,000
Alta.	212,393	91	10.0	177.3	6	2	20.81	37,185	33,975	7,216	16	1,144	13,000	4,000
B.C.	407,495	68	8.5	161.4	13	3	18.99	29,105	19,716	8,034	15	1,210	53,000	12,000
Yukon	1,717	92	9.3	174.7	9	4	24.65	41,040	37,738	65	17	$11	-	-
N.W.T.	4,051	94	9.4	185.6	11	3	29.92	54,250	50,746	206	20	$40	-	-
Nunavut	5,389	51	9.1	178.5	14	8	22.47	33,680	17,044	92	16	$15	1,000	-
Canada	**3,161,899**													
Total projected earnings for Canada										**82,918**		**13,385**	**312,000**	**64,000**

Table 4.4 concluded

Estimates of the increase in earnings and income taxes associated with moving adults with Level 1 prose literacy skills to Level 3, Canada and the jurisdictions 2003

| | | | | | | | | **Change** | | | | |
Jurisdiction	Incidence of employment	Average months worked	Average hours worked per month	Incidence of welfare (at level 3)	Incidence of E.I. (at level 3)	Average wage rate	Average earnings for those with earnings	Estimated increase in annual earnings associated with moving from prose level 1 to level 3	Estimated increase in aggregate earnings associated with moving from prose level 1 to level 3	Current income tax revenue for level 1	Number with welfare income	Number with E.I. income
	%	months	hours	%	%	dollars	$ millions	$ millions	$ millions	$ millions	number	number
N.L.	24	1.3	(0.8)	-6	-21	1.17	5,698	9,437	642	95	5,000	14,000
P.E.I.	-2	0.1	(8.4)	-21	-9	1.69	2,085	1,365	18	2	3,000	1,000
N.S.	7	(0.5)	(8.8)	0	-13	2.26	966	2,100	153	28	-	10,000
N.B.	17	(0.6)	(16.1)	-14	-9	2.98	(385)	3,754	330	46	13,000	9,000
Que.	2	0.8	11.4	-2	-17	4.39	11,898	8,427	6,748	1,585	15,000	139,000
Ont.	18	(0.2)	(3.5)	1	-8	0.51	(454)	5,563	7,501	1,189	(12,000)	108,000
Man.	18	0.4	(1.0)	1	-12	3.68	6,952	11,212	1,045	180	(1,000)	12,000
Sask.	24	1.0	9.6	-11	-13	20.07	43,817	47,185	2,184	474	5,000	6,000
Alta.	13	0.9	16.6	-2	-10	2.94	10,790	13,235	2,811	529	4,000	22,000
B.C.	14	0.6	(4.1)	4	-15	3.59	6,473	7,442	3,033	512	(15,000)	61,000
Yukon	17	1.6	25.4	-4	-23	3.36	15,888	18,802	32	7	-	-
N.W.T.	22	2.0	21.7	0	-5	7.53	26,001	30,432	123	28	-	-
Nunavut	-17	1.4	17.8	5	-28	2.46	10,949	1,615	9	3	-	2,000
Canada									**24,629**	**4,677**	**17,000**	**384,000**

Source: Special computations using the 2003 Adult Literacy and Life Skills Survey and the 2004 International Survey of Reading Skills by Doug Willms and Richard Shillington

Table 4.4 reveals that the potential economic benefits of raising adults from Level 1 to Level 3 are large, including:

- The annual incidence of employment rises in all provinces but Prince Edward Island and Nunavut, where it drops by 2% and 17% respectively.

- The increase in the annual incidence of employment is particularly pronounced in Newfoundland (24%), Saskatchewan (24%) and the NWT.

- The average number of months worked also rises in most, but not all, jurisdictions. Nova Scotia, New Brunswick and Ontario are all expected to experience modest drops in average months worked in the year.

- Change in the average number of hours worked per month is much more variable among provinces. Average hours increase markedly in some jurisdictions and drop in others. Large increases in average hours worked per month are predicted in Yukon (25.4), the NWT (21.7) and Nunavut (17.8).

- The annual incidence of welfare and employment insurance benefits receipt is predicted to fall in most jurisdictions. The predicted drops in EI recipiency are particularly marked.

- Average wage rates are predicted to increase in all jurisdictions. The increase in average wage is particularly pronounced in Saskatchewan where it is forecast to rise by $20.07 an hour.[4]

The predicted increases in labour market outcomes for Level 1 adults moving to Level 3 translate into large gains in both estimated annual labour earnings and income tax revenues. At the national level, labour earnings of the group are predicted to rise **$24,629** million per year, and amount that would yield an increase in annual income tax revenues of **$4,677** million.

Predicted reductions in the number of welfare recipients and employment insurance beneficiaries are expected to yield expenditure reductions of an additional **$115** million and **$3,270** million respectively.

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4   The propensity matching for Level 1 to 3 in Saskatchewan yielded very high estimates of wage gain due to the presence of an individual with a very high wage in the donor pool. While technically correct, a second match yielded a much more reasonable estimate of average wage gain of $4.07. As a result aggregate wage gains in the province have been overestimated by some $2,000,000.

Table 4.5

Estimates of the increase in earnings and income taxes associated with moving adults with level 2 prose literacy skills to level 3, Canada and the jurisdictions 2003

								Actual employment and earnings of adults at prose literacy Level 2 aged 16 and over, Canada and the provinces, 2003						
	Population level 2	Incidence of employment	Average months worked	Average hours worked per month	Incidence of welfare	Incidence of E.I.	Average wage rate	Average earnings for those with earnings	Average earnings including those with no earnings	Aggregate earnings level 2	Average federal and provincial income tax rates	Current income tax revenue for level 2	Number with welfare income	Number with E.I. income
Jurisdiction	number	%	months	hours	%	%	dollars	$ millions	$ millions	$ millions	%	$ millions	number	number
N.L.	71,291	68	8.1	164	29	11	17	22,690	15,358	1,095	14	153	21,000	8,000
P.E.I.	19,757	81	8.6	166	33	5	13	19,739	15,922	315	13	42	6,000	1,000
N.S.	110,053	74	8.9	161	19	6	19	25,128	18,608	2,048	14	286	21,000	7,000
N.B.	124,261	77	9.0	173	26	5	27	32,333	24,848	3,088	15	465	32,000	6,000
Que.	1,241,940	79	9.8	157	14	5	21	35,198	27,875	34,619	16	5,489	178,000	67,000
Ont.	1,595,153	79	9.5	158	9	5	19	34,119	27,107	43,240	16	6,856	138,000	76,000
Man.	142,048	84	10.0	167	8	3	31	48,216	40,472	5,749	20	1,127	12,000	5,000
Sask.	112,957	78	10.2	162	5	9	17	28,636	22,306	2,520	15	380	6,000	11,000
Alta.	435,327	84	9.9	165	6	6	19	33,501	28,275	12,309	16	1,952	24,000	24,000
B.C.	391,871	79	9.3	156	10	3	23	33,934	26,878	10,533	16	1,670	40,000	11,000
Yukon	2,729	81	8.9	162	16	13	23	37,801	30,572	83	17	14	-	-
N.W.T.	5,212	86	9.7	167	10	9	27	38,782	33,389	174	17	30	-	-
Nunavut	2,125	82	8.1	151	12	23	26	34,581	28,220	60	16	10	-	-
Canada	**4,254,724**	**79**	**9.6**	**159**	**11**	**5**	**21**	**34,063**	**27,068**	**115,831**		**18,472**	**478,000**	**216,000**

								Projected employment and earnings of adults at prose literacy Level 2 who move to Level 3 aged 16 and over, Canada and the provinces, 2003						
	Population level 2	Incidence of employment	Average months worked	Average hours worked per month	Incidence of welfare (at level 3)	Incidence of EI (at level 3)	Average wage rate	Average earnings for those with earnings	Average earnings including those with no earnings	Aggregate earnings level 2's promoted to 3	Average federal and provincial income tax rates	Current income tax revenue for level 2	Number with welfare income	Number with E.I. income
Jurisdiction	number	%	months	hours	%	%	dollars	$ millions	$ millions	$ millions	%	$ millions	number	Number
N.L	71,291	77	8.3	163.6	21	4	17	22,652	17,362	1,238	14	173	15,000	3,000
P.E.I.	19,757	79	9.6	166.4	22	4	12	21,579	17,066	337	13	45	4,000	1,000
N.S.	110,053	82	8.8	151.4	16	3	20	24,610	20,067	2,208	14	309	17,000	3,000
N.B.	124,261	79	8.9	171.0	14	2	29	33,269	26,320	3,270	16	519	17,000	2,000
Que.	1,241,940	80	10.1	159.2	12	3	23	40,073	32,093	39,857	17	6,852	151,000	38,000
Ont.	1,595,153	87	9.4	159.6	7	1	22	38,128	33,220	52,991	17	9,110	112,000	15,000
Man.	142,048	90	10.0	173.4	10	3	32	52,501	47,104	6,691	20	1,311	14,000	4,000
Sask.	112,957	92	10.8	163.8	6	3	23	39,587	36,528	4,126	17	709	7,000	3,000
Alta.	435,327	89	10.7	177.1	6	2	23	45,203	40,072	17,444	18	3,199	26,000	8,000
B.C.	391,871	88	9.5	161.9	13	3	27	42,558	37,330	14,629	18	2,683	51,000	12,000
Yukon	2,729	96	9.9	180.8	9	4	26	52,535	50,347	137	20	27	-	-
N.W.T.	5,212	92	10.0	169.2	11	3	30	44,292	40,577	211	18	39	1,000	-
Nunavut	2,125	87	8.0	145.9	14	8	28	35,455	30,851	66	16	10	-	-
Canada	**4,254,724**									**143,207**		**24,984**	**415,000**	**89,000**

Addressing Canada's Literacy Challenge: A Cost/Benefit Analysis

Table 4.5 concluded

Estimates of the increase in earnings and income taxes associated with moving adults with level 2 prose literacy skills to level 3, Canada and the jurisdictions 2003

Jurisdiction	Inci-dence of employ-ment	Average months worked	Average hours worked per month	Inci-dence of wel-fare(at level 3)	Inci-dence of E.I. (at level 3)	Average wage rate	Average earnings for those with earnings	Estimated increase in annual earnings associated with moving from prose level 2 to level 3	Estimated increase in aggregate with moving from prose level 2 to level 3	Estimated increase in income tax associated with moving from prose level 2 to level 3	Reduction in the number on welfare recipients	Change in the number on E.I.
	%	months	hours	%	%	dollars	$ millions	$ millions	$ millions	$ millions	number	number
N.L.	9	0.2	(0.7)	-8	-7	(0.38)	(38)	2,004	143	20	6,000	5,000
P.E.I.	-2	1.0	0.1	-11	-1	(0.32)	1,840	1,144	23	3	2,000	-
N.S.	7	(0.1)	(9.2)	-3	-3	0.96	(519)	1,459	161	22	4,000	4,000
N.B.	2	(0.0)	(2.2)	-12	-4	1.31	936	1,471	183	53	15,000	4,000
Que.	1	0.2	2.2	-2	-2	2.05	4,876	4,218	5,238	1,363	27,000	29,000
Ont.	8	(0.1)	1.5	-2	-4	2.37	4,009	6,113	9,751	2,254	26,000	61,000
Man.	6	-	6.2	1	0	1.55	4,285	6,631	942	185	(2,000)	1,000
Sask.	14	0.6	1.9	1	-7	5.13	10,951	14,222	1,607	330	(1,000)	8,000
Alta.	4	0.8	12.1	0	-4	3.23	11,702	11,797	5,136	1,248	(2,000)	16,000
B.C.	9	0.2	5.5	3	0	4.17	8,624	10,452	4,096	1,013	(11,000)	(1,000)
Yukon	15	1.0	19.0	-6	-9	2.61	14,734	19,776	54	13	-	-
N.W.T.	6	0.3	1.8	1	-6	2.59	5,510	7,188	37	9	(1,000)	-
Nunavut	5	(0.1)	(5.0)	3	-14	1.81	874	2,631	6	1	-	-
Canada									27,376	6,513	63,000	127,000

Source: Special computations using the 2003 Adult Literacy and Life Skills Survey and the 2004 International Survey of Reading Skills by Doug Willms and Richard Shillington.

Table 4.5 reveals that the potential economic benefits of raising adults from Level 2 to Level 3 are large, including:

The annual incidence of employment rises in all provinces but Prince Edward Island, where it drops by 2%.

- The increase in the annual incidence of employment is particularly pronounced in Saskatchewan and the Yukon, where the analysis suggests employment could rise 14% and 15% respectively.

- The average number of months worked also rises slightly in most, but not all, provinces. Nova Scotia, Ontario and Nunavut are all expected to experience modest drops in average months worked in the year.

- Change in the average number of hours worked per month is much more variable among provinces. Average hours increase in eight jurisdictions and drop in the remaining 5 jurisdictions. Large increases in average hours worked per month are predicted in Yukon (19.0) and Alberta (12.1).

- The annual incidence of welfare and employment insurance benefits receipt is predicted to fall in most jurisdictions.

- Average wage rates are predicted to increase in all jurisdictions but Newfoundland and Prince Edward Island.

- The increase in average wage is particularly pronounced in Saskatchewan where it is forecast to rise by $5.13 an hour.

- The predicted increases in labour market outcomes for Level 2 adults moving to Level 3 translate into large gains in both estimated annual labour earnings and income tax revenues. At the national level labour earnings of the group are predicted to rise **$27,376 million** per year, and amount that would yield an increase in annual income tax revenues of **$6,513** million.

- Predicted reductions in the number of welfare recipients and employment insurance beneficiaries are expected to yield expenditure reductions of an additional $427 million and $1,081 million respectively.

Table 4.6 summarizes the predicted direct economic benefits of moving all adults at Levels 1 and 2 to Level 3.

Table 4.6

Estimated aggregate economic benefits and associated rate of return of raising literacy skill levels to Level 3 for all adults aged 16 and over, Canada, 2003

	Impact of taking level 1's and 2's to level 3		
	Level 1 to 3	Level 2 to 3	Combined
	$ million		
Return in public taxes/savings	8,062	8,021	16,083
Income tax revenue	4,677	6,513	11,190
Social assistance	115	427	542
Total cost of raising skill to level 3		**6,401**	
Estimated rate of return		**251%**	

The table documents that an investment that raised all Canadian adults to prose literacy level 3 could potentially yield remarkable economic benefits. The estimated rate of return is 251%, suggesting that the investment could pay for itself in as little as 4.8 months and yield a steady stream of economic benefits thereafter.

Readers should take these estimates with the proverbial "grain of salt".

On the one hand the estimates might represent the minimum expected direct economic effect as they do not reflect the expected increases in consumption taxes, such as PST and GST, that would be associated with higher incomes, nor do they assign any value to the health, education and social benefits that would undoubtedly be precipitated by the investment.

On the other hand the estimates might over-estimate the expected direct economic benefits if the level of skill demand is insufficient to ensure that all of the newly created skill can be absorbed by the Canadian economy. The fact that analyses have documented the presence of significant amounts of skill loss in some groups of Canadian adults suggests that this may well be the case (Willms and Murray, 2007). Skill loss can be interpreted as a sign of inadequate skill demand in some Canadian industries and occupations.

It is also possible that it might take some time for the Canadian labour market to absorb the newly created skills and to establish a new, higher skills

equilibrium, so it would take some time for the expected benefits to be realized. It is also likely that it would take a full decade for Canada's adult education system to train the roughly 9,000,000 adults who need literacy upgrading.

With these caveats in mind the analyses leave little doubt that investment in literacy could potentially yield impressive economic benefits.

Macro-estimates of economic benefits

The second approach to estimating the likely economic benefits of raising all Canadian adults to prose literacy level 3 involves applying Coulombe and Tremblay's estimates of the long-term relationship between average literacy scores and the growth of GDP per capita (Coulombe and Tremblay, 2005). This analysis identifies two significant economic effects of literacy:

- A level effect in which a 1% increase in average literacy scores results in a 1.5% permanent increase in GDP per capita.
- A distributional effect in which higher proportions of Level 1 adults appear to limit growth to a considerable extent.

One strength of this approach is that it captures the actual net economic benefits realized in the Canadian economy from all sources, including the positive health benefits and the negative impact of any inadequacy in the level of skill demand in the Canadian economy.

On the other hand, assuming the long-term relationship between literacy and economic growth may underestimate the true impact of literacy on economic performance in the emerging knowledge-based economy. The evidence summarized in Chapter 1 of this volume suggests that the influence of literacy on macro-economic performance may actually rise as the skill and knowledge content of jobs increases.

McCracken and Murray (McCracken and Murray, 2008) estimate the cost and benefits of moving all adults to prose level 3.

As revealed in Table 4.7 the estimated rates of return, while lower than the estimated direct benefits, are still strongly positive. Estimated rates of return range from 36% over 5 years, 80% over 10 years and 83% over 25 years.

Table 4.7

Estimated Costs, Benefits and Rates of Return assuming historical rate of return to literacy skill, Canada

	Discount rate	Estimated internal rate of return (%)
Net Benefit (25 year horizon)		
$1,949,871,628,673	0	83
$825,264,279,156	0.05	
$385,563,050,106	0.1	
Net Benefit (10 year horizon)		
$164,333,771,476	0	80
$109,067,514,464	0.05	
$73,940,546,975	0.1	
Net Benefit (5 year horizon)		
$8,890,902,805	0	36
$6,380,331,391	0.05	
$4,506,380,138	0.1	

Source: Murray and MaCracken, 2008.

While still rough approximations, the estimated benefits reflect the long term relationships observed between literacy levels and economic growth and so should be more realistic than the propensity matched approximations of employment and wage benefits.

The fact that these estimates are lower than the estimated direct benefits suggests that the Canadian economy will have difficulty absorbing the additional supply of literacy skill. This reinforces the need for measures to increase the demand for literacy skill to complement the supply-side investments.

4.4   Who should pay

The issue of who should pay for the suggested literacy investment is a complex one as the answer depends on whether individuals and the firms they work for have the means to finance the upgrading themselves, whether there is a failure in the Canadian literacy market induced by a lack of information or the presence of large externalities, whether private finance would yield rapid enough improvement in literacy skill to attenuate the negative economic consequences of having inadequate skills and if the Canadian literacy industry is capable of delivering training of the required quality.

Individual citizens, employers and Canada's governments have been investing in increasing adult literacy levels but nowhere near the level indicated above.

Thus, the question remains – who should pay and how can they be induced to pay?

As noted above, our analysis suggests a failure of magnificent proportions in the Canadian literacy market, a fact that suggests a role for government in the fix.

... the Federal government

A strong case can be made that the federal government must assume the responsibility for financing programs for Latent Classes A2 and B2, the two classes that are largely defined by immigration status.

These immigrant-dominated classes have considerably higher levels of educational attainment than Canadian-born adults. Thus, a rapid social and economic integration will allow immigrants to take full advantage of their education, knowledge and skills. The size of the economic benefits that would flow to Level 3 literacy skills are large by any measure and suggest that the investment could be re-couped through increased tax revenue in as little as a few years. The Federal government also has a moral obligation to reduce the gap in economic performance between immigrants and non-immigrants, and differences in literacy would appear to underlie much of this gap.

The majority of Canada's low literate adult aboriginals fall into these two classes reinforcing the case for federal responsibility.

The federal government should also take steps to ensure that the level of skill demand is adequate to ensure that the economy will be able to absorb the newly created skills.

…the provincial governments

The fact that Classes A1 and B1 are largely made up of native-born Canadians who either left the education system with low literacy levels, or who have since lost sufficient literacy skill to fall below level 3 levels, suggests that provincial governments should assume responsibility for this investment. This conclusion is buttressed by the fact that many of these adults have relatively low income levels and much higher probabilities of receiving social assistance benefits.

…individuals and firms

The fact that adults in Class C are almost all employed and earning reasonably high wages suggests that they could self-finance their skill increase.

The same argument can be made for adults in Class D. While the investments are modest in size, few employers will subsidize such training unless government offers inducements to do so.

Doing so would only make sense for these individuals if they could be sure that employers would pass on at least some of the expected productivity gains in the form of higher wages. If this is not the case then it would be reasonable for governments to induce firms to offer this training by offering them tax incentives.

The fact that so few of those adults with skills below Level 3 recognize the fact that their skills may limit their opportunity in the future can be taken as a sign of a market failure of magnificent proportion. At a minimum this suggests the need for a massive social marketing campaign to raise awareness of the issue. The cost/benefit results suggest a more active role for government in financing the required training as the estimated rates of return are strongly positive and the payback periods short even under the most conservative of assumptions.

Chapter 5

Summary and conclusions

The initial chapter of this report makes the case for an urgent investment to solve Canada's putative literacy "problem".

Among other things the analyses presented establish that:

- literacy is economically and socially important to individuals, with differences in literacy score explaining a significant proportion of social inequality in a range of outcomes.

- literacy is economically important to macro-economic performance, with differences in the average level of literacy explaining 55% of differences in long term growth rates of GDP per capita and labour productivity in OECD economies. The distribution of literacy skill has also been shown to have an impact, with higher levels of low skilled adults inhibiting GDP growth.

- literacy is likely to become more, rather than less, important as the global knowledge economy continues to grow.

It is possible to conceive of Canada's literacy "problem" as an opportunity.

Canada's workforce possesses one of the highest levels of education, skill and experience in the world, a fact that represents an enormous economic potential.

Releasing this potential depends on Canadians having access to the tools they need to compete in a fiercely competitive global economy.

Simply put, literacy is the single most important tool that Canadians need to realize their full economic potential.

Providing all Canadians with adequate literacy skill depends upon three things:

- Adults with low literacy skill agreeing to participate in instructional programs,

- educators matching their program offerings to the diverse needs of learners, and,

- sufficient investment to support program delivery.

A case can be made that the Canadian literacy market is seriously inefficient. This inefficiency can be traced to several things including the possibility that:

- many adults have no way to judge the adequacy of their skill, a fact that causes them to under-invest.

- many of the benefits that would accrue to an increase in literacy are indirect. Such externalities lead potential learners and the firms they work for tend to under-invest.

- the product offering in the literacy market may not be well matched to the implicit demand.

- tthe product offering in the literacy market may not be well matched to the implicit demand.

The analyses presented in this report represent an attempt to improve the efficiency of the literacy market through the provision of hitherto unavailable market intelligence.

The segmentation analyses presented in the CCL report provide market players with a clear picture of the overall size of the basic literacy market and of key segments within the market.

The Canadian literacy market is made up of 12 distinct market segments, each defined by a unique set of learning needs and demographic characteristics.

The sizes of the segments vary dramatically from a high of 3,161,000 to a low of 16,000.

This information provides adult educators with sufficient insight to specify the characteristics of "best practice' programs for each class of adult learner. The indicative program responses differ dramatically for each segment in reflection of their distinct learning needs and characteristics.

The number of instructional contact hours varies from a high of 375 to a low of 40 and average class sizes vary from 5 to 20.

The differences in program duration and design thus translate into dramatically different unit costs for each class, ranging from a high of $4441

for members of French Class A1 to a low of $229 for members of English Class D.

Combined, the size of each segment and the unit cost of instruction provides a first order approximation of the cost of raising all adults to the desired proficiency level.

At **$6,400,975,510** the total estimated cost of delivering the requisite literacy programs seems large but is a relatively low amount compared to a range of government programs, such as the Employment Insurance and Social Assistance programs, programs that only deal with the symptoms of inadequate literacy rather than treating the "disease" itself.

Assuming Canada's economy could absorb all of the newly created literacy skill, the estimated direct economic benefits of solving Canada's literacy problem are large.

The estimated cost of raising the literacy proficiency of all adult Canadians to Level 3 is offset by an annual increase in aggregate income tax revenue at the national level of **$11,140 million** due to predicted increases in the incidence of employment, months worked, hours worked and wage rates.

To this amount an additional **$27,376 million** and **$4,351 million** need to be added to account for savings realized through the anticipated decreases in Employment Insurance and Social Assistance benefits.

Subtracting total costs from total benefits yields an estimated total net benefit of **$16,083 million** per annum.

Thus, national estimates of costs and benefits imply a rate of return of roughly 251% in the first year. In fact, were all of these benefits realized, the investment would yield an approximate pay back period of 4.8 months.

As noted above it is important to remember that these estimates **exclude** a range of indirect economic benefits associated with lower health, social and educational costs and increases in consumption taxes. Adding in these additional benefits would strengthen the case for investment.

The estimated economic benefits vary considerably by province and territory as a result of differences in their industrial, occupational and wage structures. In a few cases, moving adults to Level 3 precipitates a slight drop in earnings. This reinforces the need for government policies to stimulate the level of skill demand in the economy, policies that would ensure that the Canadian economy is able to absorb and apply the newly created skills.

This report does not include estimates of rates of return by province and territory because the sample sizes available in the ISRS study were not large enough to provide reliable estimates of the size of the market segments at this level.

As noted above, a literacy investment of the proposed magnitude would generate additional benefits, such as reduced health and social costs. Assuming the historical relationship between literacy skill and the rate of overall economic growth an investment spread over 10 years would yield estimated rates of return of 36% over 5 years, 80% over 10 years and 83% over 25 years. The fact that these estimates are lower than the estimated direct benefits suggests that the Canadian economy will have difficulty absorbing the additional supply of literacy skill. This reinforces the need for measures to increase the demand for literacy skill to complement the supply-side investments. Were the government to institute measures to increase the social and economic demand for literacy skill then the estimated direct economic benefits would fall somewhere between 86% and 251%.

A case can be made that different institutions should assume responsibility for different groups of learners.

A strong case can be made for the federal government to assume responsibility for the two immigrant-dominated classes. Higher levels of Federal investment in immigrant literacy and language training would permit these highly educated new Canadians to achieve their full economic potential.

The fact that these classes also contain most of Canada's aboriginal adults with low literacy skills also argues for a strong Federal role.

An equally strong case can be made that provincial governments should assume responsibility for their Canadian-born peers in the two lowest skilled classes. Adults in these classes either left the education system without the requisite skills or were not equipped with durable skills.

It is not clear who should assume financial responsibility for the two highest classes. While a case can be made that individuals and their employers should assume the cost of remediation, governments may have to offer tax incentives to induce them to do so. There is strong prima facie evidence of market failure in the literacy market of the sort only governments have the tools to fix.

At one extreme governments might choose to invest in social marketing to increase the awareness of and demand for literacy programs. At the other extreme, governments might choose to finance the cost of the full literacy investment.

While the optimal mix of policy remedies is a matter for public discussion and debate, there can be little question that action is needed if Canadians are to realize their full economic potential in a fiercely competitive global economy.

Annex A

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