Literacy in the workplace

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The ability to read, write and use numerical information is crucial for labour market success and social well-being. Inadequate literacy skills reduce employment prospects and limit participation in society (Power, 1983; CERI, 1992; OECD and Statistics Canada, 1995). Also, countries with highly literate populations are expected to be more competitive. The argument goes that success in today's global economy requires skilled workers capable of continually learning and adapting to change (OECD and Statistics Canada, 1995; Statistics Canada, 1996; Clark, 1996). Thus, literacy is central to discussions about human resource development and skills use at the individual, workplace and national levels.

This article examines the "fit" or "mismatch" between the job requirements of Canadian workers and their literacy skills, profiling patterns of literacy use and under-use in the labour market. The study uses the Canadian component of the International Adult Literacy Survey (IALS) to measure three types of literacy (prose, document and quantitative) (see *Data source and definitions*).[1]

Initial IALS findings underscore the importance of literacy for individual economic success: large income "penalties" and "bonuses" exist for low and high literacy levels, respectively, in Canada and the United States (Statistics Canada, 1996). But the IALS results also hint at possible under-use of literacy skills. For example, international comparisons suggest that some Canadian workers – notably those in skilled craft occupations – have fewer opportunities to use their literacy skills on the job (Statistics Canada, 1996; Crompton, 1996). This study focuses on the issue of literacy under-use, arguing that it has serious implications in an economic environment that increasingly rewards skills acquisition and lifelong learning.

The analysis was guided, among others, by the following question: to what extent do Canadian workers use their literacy skills on the job? That is, what is the fit or mismatch between workers' literacy skills and their literacy needs in the workplace?

Although the term "underemployment" is sometimes used to indicate insufficient hours or weeks of work, it also aptly describes the under-use of skills

Data source and definitions

The International Adult Literacy Survey (IALS) was a seven-country (Canada, Germany, the Netherlands, Poland, Sweden, Switzerland and the United States) cross-sectional research initiative conducted in the autumn of 1994. Its goal was to create comparable national literacy profiles, by testing literacy proficiency with sophisticated measurement techniques using "real-world" materials. More detail on the study design and measurement techniques can be found in OECD and Statistics Canada (1995) and Statistics Canada (1996).

The IALS measured proficiency in three distinct literacy domains (Table 1):

Prose literacy – the knowledge and skills needed to understand and use information from texts including editorials, news stories, poems and fiction;

Document literacy – the knowledge and skills required to locate and use information contained in various formats, including job applications, payroll forms, transportation schedules, maps, tables and graphics; and

Quantitative literacy – the knowledge and skills required to apply arithmetic operations, either alone or sequentially, to numbers embedded in printed materials, such as balancing a chequebook, figuring out a tip, completing an order form or determining the amount of interest on a loan using an advertisement.

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(Redpath, 1994; Statistics Canada, 1997). This form of underemployment – a *literacy surplus* problem – is as much a concern as the *literacy deficit* problem (inadequate levels of literacy among workers) that has captured public attention in the past decade. Both problems should be addressed within the same fit-mismatch framework. At one end of the continuum are workers whose literacy skills fall well below the minimum requirements in most jobs. At the other end are the highly literate employed in jobs that frequently underuse their skills. In the first case, potential human resources are not being developed. In the second, the human capital available is not being optimally used. As a result, some of it may be lost (Krahn, 1997).

Thus, it is essential to focus not only on persons with skill deficits but also on persons whose skills surpass the requirements of the job. For workers with moderate or high levels of literacy, the long-term effect of working under such circumstances could be loss of skills. For workers with low literacy levels, an unchallenging work environment could reduce the likelihood of their developing literacy skills either on or off the job.

Literacy fit and mismatch in the workplace

To what extent do employed Canadians use their literacy skills at work? Defining optimal use of a society's human capital (in this study indexed by literacy skills) is difficult, because sometimes workers change jobs or jobs change in their skill requirements. All the same, a better fit would be preferred over a poor fit (see *Constructing measures of literacy fit and mismatch in the workplace*). Ideally, public policy coupled with market incentives would induce employers to increase workplace literacy requirements (that is, to create more knowledge-based jobs), and to encourage employees with lower literacy skills to upgrade through further education and training.

Regarding prose literacy and reading-writing requirements in 1994, about 2 million workers with low literacy skills were in jobs that presented them with

Table 1: Levels of prose, document and quantitative literacy, workers 16 and over

	Employed population		
	Prose literacy	Document literacy	Quantitative literacy
	%		
All levels	**100**	**100**	**100**
Level 1	12	12	12
Level 2	25	24	25
Level 3	37	35	36
Level 4/5	26	29	27
Mean*	287	291	292

Source: International Adult Literacy Survey, 1994
* *Measured on a possible range of 0 to 500.*

Constructing measures of literacy fit and mismatch in the workplace

A reading-writing index and a numeracy index were used to measure the fit or mismatch between workers' literacy skills and their job requirements. Both indices range from 1.0 to 5.0, because they were based on responses (numbered one to five) to the IALS questions. The values for each workplace requirement index were collapsed into four categories (1.0 to 1.99 = 1; 2.0 to 2.99 = 2; 3.0 to 3.99 = 3; 4.0 to 5.0 = 4) that reflected the range of categories ("rarely–never" to "every day") concerning workplace literacy requirements, with higher values indicating more frequent reading-writing or mathematical requirements.

These four-category measures were then cross-tabulated by the literacy (also four levels; Table 1) of employed sample members. Specifically, the distributions of prose literacy and document literacy were cross-tabulated by the reading-writing requirements measure (Tables 2 and 3, respectively), and quantitative literacy was cross-tabulated by the numeracy requirements measure (Table 4). For each literacy dimension examined in the IALS, five combinations were possible, given the construction of the two measures: low literacy skills and low literacy requirements in the workplace; medium literacy skills and medium literacy requirements; high literacy skills and high literacy requirements; low literacy skills and high literacy requirements (a literacy deficit); high literacy skills and low literacy requirements (a literacy surplus). Workers whose literacy skills roughly fit their job requirements (low-low, medium-medium and high-high) appear from top left to bottom right of the relevant table.

The tables also show the number who were mismatched; that is, those who exhibited either a literacy deficit (the upper right corner of the table) or a literacy surplus (the lower left corner of the table). The latter might also be described as "underemployed" in terms of their literacy skills. The deficit category includes workers whose measured literacy ability was at least two categories below the literacy requirement of their job. In contrast, those whose measured literacy ability was at least two categories above the literacy requirement of their job exhibited a surplus.

few literacy requirements (Table 2). Close to 4 million had medium-level skills and were employed in jobs with mid-range requirements. Half of all workers with Level 2 prose literacy were in this situation, as were 55% of those in the next highest level. About 2.5 million Canadians with high literacy skills were in jobs requiring a high degree of prose literacy.

Some 21% of those with Level 3 prose skills were in jobs with low workplace reading-writing requirements (Table 2; Chart A). Fully half of those with the highest prose literacy scores (Level 4/5) were in the surplus category. Thus, in absolute numbers, about 2.5 million Canadians were in jobs that did not appear to take full advantage of their prose literacy skills. Literacy deficits reflect the other possible form of mismatch. However, with respect to prose literacy, this problem is not as widespread. In 1994, about 700,000 workers were in jobs with reading-writing demands that appeared to exceed their skills,[2] including 19% of those at Level 1 in prose literacy and 16% of those at Level 2 (Table 2; Chart B).

Table 2: Prose literacy fit-mismatch in the workplace

	Workplace reading-writing requirements (%) *Population estimates ('000)*				
	1 (low)	2	3	4/5 (high)	Total
Prose literacy level					
1 (low)	64 *839*	17 *221*	12 *162*	7 *85*	100 *1,307*
2	34 *993*	31 *924*	19 *572*	16 *469*	100 *2,958*
3	21 *931*	26 *1,150*	29 *1,279*	24 *1,039*	100 *4,399*
4/5 (high)	10 *304*	41 *1,283*	30 *917*	19 *598*	100 *3,102*
Total	*3,067*	*3,578*	*2,930*	*2,191*	*11,766*

Source: International Adult Literacy Survey, 1994

Key to shading:

Low skills – low requirements

Medium skills – medium requirements

High skills – high requirements

Fit between skills and requirements

Low skills – high requirements (literacy deficit)

High skills – low requirements (literacy surplus)

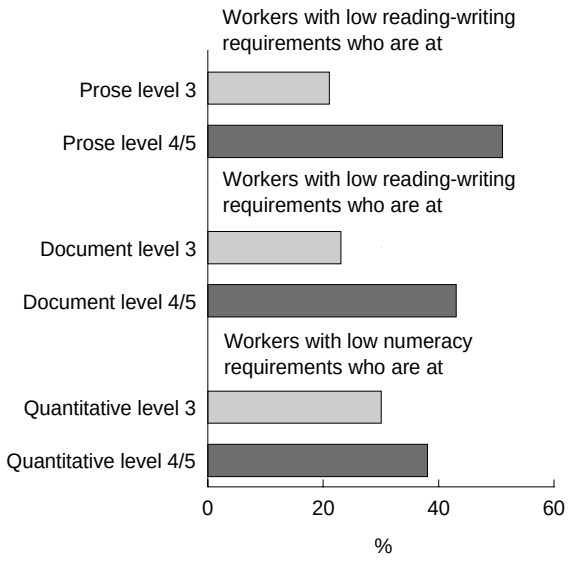
Mismatch between skills and requirements

Regarding document literacy surplus, 23% of employed Canadians in Level 3 and 43% in Level 4/5 occupied jobs with low literacy requirements (Table 3; Chart A). Combined, this represents about 2.5 million individuals in jobs that did not seem to require their level of skill, a total similar to that observed for prose literacy. The pattern of document literacy deficit also paralleled the prose pattern, with around 15% in each of Levels 1 and 2 holding jobs that required literacy skills two or more levels higher (more than 600,000 in total).

Patterns of quantitative literacy versus workplace numeracy requirements were somewhat different (Table 4). The low skill-low requirement group was somewhat smaller (about 1.7 million) than those in the other scales (or domains), as was the medium-medium group. The latter included 43% of the employed with Level 2 quantitative skills and 35% of those in Level 3 (about 2.8 million people in total). In turn, the group in the skill surplus category was proportionally larger for those in Level 3 (30%), but somewhat smaller for Level 4/5 (38%; Chart A). Still, the absolute size of this group was similar, at around 2.5 million. In contrast, the group defined as having skill deficits (about 1.3 million; Chart B) and workers in the high skill-high requirement fit category (almost 3.5 million) represented larger proportions of the total employed labour force in 1994.

The proportions of Canadians employed in both medium-medium and high-high fit situations were larger for all three types of literacy than the proportion in low-low fit settings (Table 5). In fact, for quantitative literacy, the high-high category was the largest. Assuming that a high-skill economy

Chart A: Fully half of employed persons with high prose literacy scores had jobs with low reading-writing requirements.



Source: International Adult Literacy Survey, 1994
Note: Workers with a skill surplus had job requirements two levels lower than their literacy scores (see lower left of Tables 2, 3 and 4).

(referring both to workers and their jobs) is preferable to lower-skill alternatives, these are encouraging results.

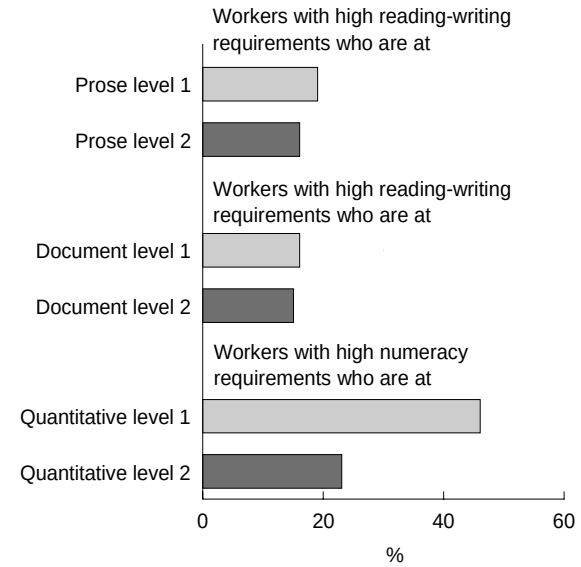
But the finding that more than one in five workers were in jobs that did not appear to make full use of their literacy skills is troubling, particularly because public discussions of the "skills gap" in the labour force frequently imply that the problem is one of a shortage of skilled workers, not skilled jobs.[3] The 5% to 11% placed in the skill deficit category are also cause for concern, but for different reasons (that is, they may not be capable of performing their jobs adequately). Even if the measures of fit and mismatch were calculated differently, thus raising or lowering the proportions in the surplus and deficit categories, questions would remain about the relatively poor fit between workers' literacy skills and their jobs.

Interpreting the results

Although more Canadians are employed in settings roughly compatible with their literacy skills, a good many are not well-matched to their job requirements. Within the mismatch categories, a greater proportion experience a skill surplus (or underemployment) than a skill deficit (insufficient literacy skills for one's job).

The IALS prose, document and quantitative literacy scales have proved to be highly useful for examining literacy fit and mismatch in the Canadian workplace. Yet it is also true that other skills influence success in the workplace. Informal or working knowledge, as well as the tacit skills that many workers acquire while working and interacting with co-workers, is equally important (Harper, 1987; Collins, Balmuth and Jean, 1989; Damon, 1991). In fact, adults who do not read well sometimes develop surprisingly sophisticated methods of coping with their literacy handicap (Fingeret, 1990; Gowen, 1994). Moreover, the absence of "hard" literacy skills does not necessarily mean a lack of "soft" teamwork and oral communication skills.[4] Hence, it must be remembered that only one, albeit important, dimension of the workplace skills equation is examined here. Workplace literacy requirements and workplace skills may need to be

Chart B: More than 40% of employed persons with low quantitative literacy had jobs with high numeracy requirements.



Source: International Adult Literacy Survey, 1994
Note: Workers with a skill deficit had job requirements two levels higher than their literacy scores (see upper right of Tables 2, 3 and 4).

Table 3: Document literacy fit-mismatch in the workplace

Document literacy level	Workplace reading-writing requirements (%) *Population estimates ('000)* 1 (low)	2	3	4/5 (high)	Total
1 (low)	62 *846*	22 *293*	8 *111*	8 *102*	100 *1,352*
2	31 *872*	31 *869*	23 *657*	15 *422*	100 *2,820*
3	23 *959*	32 *1,302*	26 *1,067*	19 *782*	100 *4,110*
4/5 (high)	11 *390*	32 *1,115*	32 *1,095*	25 *885*	100 *3,485*
Total	*3,067*	*3,579*	*2,930*	*2,191*	*11,767*

Source: International Adult Literacy Survey, 1994

Key to shading:

Low skills – low requirements

Medium skills – medium requirements

High skills – high requirements

Fit between skills and requirements

Low skills – high requirements (literacy deficit)

High skills – low requirements (literacy surplus)

Mismatch between skills and requirements

defined and measured more generally in the future.

Reading letters and memorandums is the most common literacy requirement, reported by more than half of all workers as a daily activity. A sizeable minority (about 30% to 40% in 1994) also engaged daily in various other reading, writing and mathematical activities. Yet, depending on the specific task, between 20% and 60% of workers rarely or never used these literacy skills. Certainly, not all these tasks are required in jobs that otherwise might be considered skilled and intellectually demanding. Oral communication of complex information – the stock-in-trade of customer helplines, call centres and telephone financial services – exemplifies a form of skilled work that may have only moderate or low literacy requirements by IALS standards.

Within the IALS definition of literacy, a useful contrast can be made between quantitative literacy and prose and document literacy. As this analysis reveals, large numbers of jobs require only one type of skill. The patterns of fit and mismatch vary among the three. Since quantitative literacy is the strongest correlate of income in North America (Statistics Canada, 1996), it is tempting to conclude that most human resource development efforts should be targeted here. However, the social and economic benefits of prose and document literacy are not as easily established with a measure such as income. The ability to read and write improves one's quality of life in other ways. Furthermore, many non-work activities reinforce prose literacy, especially in contrast to the more restricted, workplace setting in which numerical skills are more likely used.

Implications of the findings

The distribution of on-the-job literacy requirements across occupations is polarized, consistent with other job rewards (for example, income, benefits, status and training opportunities). Thus, managers have more challenging jobs in all three literacy dimensions, and professionals have high reading and writing demands. Other occupations have substantially lower literacy requirements. "Good jobs" as defined by full-time and permanent status (Economic Council of Canada, 1990) also offer more challenging work environments.

This analysis finds a reasonable fit between literacy skills and job requirements for about three-quarters of the labour force. This fit is not surprising, since workers with higher skills might be expected, in time, to find their way into (or be recruited into) jobs that require such skills, whereas those with few skills would not move up. Within the literacy fit category, however, are large proportions of workers in low-low and medium-medium positions. Assuming the goal is to compete with other nations for the best jobs, both in terms of national productivity and personal rewards for workers, the challenge will be to shift more

Table 4: Quantitative literacy fit-mismatch in the workplace

Quantitative literacy level	Workplace numeracy requirements (%) *Population estimates ('000)* 1 (low)	2	3	4/5 (high)	Total
1 (low)	44 *571*	10 *130*	31 *394*	15 *196*	100 *1,291*
2	34 *1,020*	10 *284*	33 *990*	23 *698*	100 *2,992*
3	30 *1,263*	8 *328*	27 *1,185*	35 *1,501*	100 *4,277*
4/5 (high)	16 *520*	22 *721*	28 *904*	34 *1,092*	100 *3,237*
Total	*3,374*	*1,463*	*3,473*	*3,487*	*11,797*

Source: International Adult Literacy Survey, 1994

Key to shading:

Low skills – low requirements

Medium skills – medium requirements

High skills – high requirements

Fit between skills and requirements

Low skills – high requirements (literacy deficit)

High skills – low requirements (literacy surplus)

Mismatch between skills and requirements

might be expected to have roughly similar proportions of workers in the surplus and deficit categories. But the findings show that the former outnumber those in the deficit category by a ratio of about two-to-one for quantitative literacy, three-to-one for prose literacy, and four-to-one for document literacy. These ratios depend, in part, on the way literacy requirements are measured and cutting-points determined, although the basic pattern remains.

Previous discussions of the job-skills gap have focused mainly on the problem of workers with literacy deficits. Yet in terms of the costs to individuals, firms and the national economy, underemployment is more widespread, as indicated by the proportion of workers in this category. Of even greater concern is the potential loss of some of these workers' skills or, in a broader sense, of previous investments in human capital (Krahn, 1997).

workers into the high-high category (Krahn, 1997). Given the definition of "best jobs," this shift will require an investment in human capital (that is, literacy skills) and a creation of jobs with higher literacy requirements. The latter appears to have the greater need, as the labour force already includes several million workers who seem to be employed in jobs that do not take full advantage of their literacy skills.

A theoretical explanation of the size of the mismatched group (about one in four workers, whether in literacy deficit or literacy surplus) is not immediately apparent. A mismatch of this size suggests that the labour market is not sufficiently self-correcting. Furthermore, a labour market approaching equilibrium

Table 5: Worker/workplace literacy fit-mismatch

	Fit			Mismatch	
	Low-low	Medium-medium	High-high	Low-high (deficit)	High-low (surplus)
			%		
Literacy domain					
Prose	17	34	22	6	21
Document	17	33	24	5	21
Quantitative	15	24	29	11	21

Source: International Adult Literacy Survey, 1994
See Tables 2, 3 and 4 for details on the three fit and two mismatch categories.

Notes

1 For further discussion of the IALS and some of its findings, see OECD and Statistics Canada (1995); Statistics Canada (1996); Hardwick (1996); Clark (1996); Crompton (1996); Krahn (1997); Willms (1997); and Bloom et al. (1997).

2 IALS measured generic skills. These workers could, through practice, cope but are deemed to lack skills necessary to deal with equally difficult tasks drawn from unfamiliar contexts.

3 Daniel Boothby drew similar conclusions from his analysis of data from the 1989 Literacy Skills Used in Daily Activities (LSUDA), but suggested that 3.5 million Canadians with "relatively high levels of reading ability … [were] working in jobs which made little, if any, call on these skills" (Boothby, 1993, 33). Direct comparisons between his count and this study's are not possible, however, because different measures of workplace literacy requirements were used. This study relied on workers' own assessments of reading, writing and mathematical requirements in their jobs, while Boothby classified occupations according to their typical educational requirements, using General Educational Development (GED) scores.

4 In fact, the coping strategies employed by some less-literate workers indicate strong teamwork and oral communication skills. Nevertheless, these workers will not be able to take their informally acquired tacit knowledge and apply it elsewhere as easily as could individuals with formally acquired reading, writing and numeracy skills (Damon, 1991).

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