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Adult language, literacy, numeracy and problem-solving skills in the workplace

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This paper examines the performance of the eight major occupational categories across the four skill areas of the Adult Literacy and Life Skills Survey. The results indicated that some 38–64% of employed Australians were below minimal competence (at Level 1 or Level 2) in one of the four skill areas of prose literacy, document literacy, numeracy or problem-solving skills. A pattern of greatest need was identified amongst two occupational groups, namely, machinery operators/drivers and labourers. There was also a clear occupational hierarchy in the area of problem-solving skills that was considered to reflect a social bias since it was inconsistent with the three other skill areas. The findings also highlight pockets of social disadvantage and inequality with many labourers outperforming managers and professionals. It was concluded that the pattern of performance across occupations and skill levels was statistically and significantly different than chance.

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At some time almost everyone would have encountered a lack of competence in adult levels of literacy and numeracy. Without any wider experience, it is likely that they might perceive it as an isolated instance or just an individual issue. This is because they would not normally be in a position to gauge the extent of the deficit at a macro-level.

The general issue of literacy has been addressed at a national level since 1996. Reading was assessed as part of an international study through the *Adult Literacy and Life Skills Survey* that is conducted by the Australian Bureau of Statistics. The most recent *Adult Literacy and Life Skills Survey* assessed prose literacy and document literacy, as well as numeracy and the ability to solve problems using real-life tasks. This official survey reported the raw data in terms of five skill level categories but of necessity did not purport to make analyses beyond the basic socio-demographic groups. For instance, it did not make comparisons across occupational groups to provide a picture of literacy and numeracy in the workplace.

The purpose of this brief report is to analyse the results of the *Adult Literacy and Life Skills Survey* as a guide for future emphasis in adult training and labour market programs. The approach is overly quantitative but the interpretation of the results is descriptive. This study is part of a larger program of research that focuses on the fundamental importance of reading in the workplace (Athanasou 2011).

Background to the Adult Literacy and Life Skills Survey

The *Adult Literacy and Life Skills Survey* (ALLS) focuses on four broad constructs:

- *Prose literacy*: the ability to understand and use information from various kinds of narrative texts, including texts from newspapers, magazines and brochures;
- *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 charts;
- *Numeracy*: the knowledge and skills required to effectively manage and respond to the mathematical demands of diverse situations; and
- *Problem solving*: goal-directed thinking and action in situations for which no routine solution is available (*Adult Literacy and Life Skills Survey* 2006: 4)

The five skill levels of the survey range from Level 1 (the lowest) to the combined Levels 4 and 5 (highest levels). Level 3 is cited as the minimum standard adequate for coping with demands in a developed economy. The results are reported comprehensively in the Australian Bureau of Statistics, Catalogue No. 4228.0 (re-issued in January 2008).

The proportion of employed Australians below minimal competence (at Level 1 or Level 2) was 39.5% for prose literacy, 38.6% for document literacy, 44.5% for numeracy and 64% for problem solving (see Table 1). At first glance, the proportions at Level 1–2 might seem high to a layperson, but these results support the experience of deficits in adult basic skills in the workplace. They highlight the magnitude of the problems encountered by professional practitioners in adult basic education.

Table 1: Skill levels of employed people across all industries

Skill area	Level 1	Level 2	Level 3	Level 4/5
Prose literacy	11%	28%	41%	20%
Document literacy	12%	27%	40%	22%
Numeracy	15%	29%	35%	20%
Problem solving	27%	37%	29%	7%

All percentages rounded

Notwithstanding any conceptual, technical or statistical limitations of these international surveys, the findings may still provide an initial basis for intra-national comparisons. Certainly the scope and breadth of the survey is unrivalled in Australia as it is based on a national random sample of households. Readers interested in the theory and methods underlying the international *Adult Literacy and Life Skills Study* are referred to the document *Measuring adult literacy and life skills: New frameworks for assessment* (available for download at: www.statcan.ca).

In this paper, the proportion of persons in an occupation who were categorised as Level 1, Level 2, Level 3 and Levels 4–5 were compared with the overall distribution. The purpose was to highlight those adults in occupations that had greater or lesser proportions than the total workforce across Australia. The following sections explore the specific findings in relation to three key questions.

Which skill level is most characteristic of an occupation?

Table 2 indicates the modal category of competence for each occupational group. This analysis focuses on the proportions of workers at each level within each occupation separately.

Each row in Table 2 is read independently and shows which skill level was the most popular within each occupation. In other words, it tries to characterise each occupation. For instance, in terms of prose

literacy, it is noted that most managers were at level 3; for document literacy most managers were at level 3 and similarly for numeracy and problem solving. The situation was quite different for labourers. Most labourers were at level 2 for prose literacy, document literacy and numeracy, but at level 1 for problem solving.

From Table 2, one would infer there is a pattern of greatest need amongst two occupational groups, namely machinery operators/ drivers and labourers. There is also a clear occupational hierarchy in the area of problem-solving skills when it decreases from level 3 for managers and professionals through level 2 for technicians and trades, community and personal service workers, clerical and administrative workers and sales workers, then to level 1 for the remaining occupational groups.

Table 2: Modal level of competence across occupational groups

Occupation	Prose literacy	Document literacy	Numeracy	Problem solving
Managers	Level 3	Level 3	Level 3	Level 3
Professions	Level 3	Level 3	Level 3	Level 3
Technicians and trades	Level 2	Level 3	Level 3	Level 2
Community, personal service workers	Level 3	Level 3	Level 2	Level 2
Clerical, administrative workers	Level 3	Level 3	Level 3	Level 2
Sales workers	Level 3	Level 3	Level 3	Level 2
Machinery operators, drivers	Level 2	Level 2	Level 2	Level 1
Labourers	Level 2	Level 2	Level 2	Level 1
Total employed	Level 3 (41%)	Level 3 (40%)	Level 3 (35%)	Level 2 (37%)

Both prose literacy and document literacy are characterised by two clusters (a) machinery operators/drivers and labourers and (b) all other occupations. Numeracy shows a different clustering but still with two major groups, (a) community, personal service workers, machinery operators/drivers and labourers in one group and (b) all other occupations in the second group. Problem solving reveals three broad groups. The first is (a) machinery operators/drivers and labourers that show low levels; (b) a middle grouping which peaks at level 2 and comprises technicians–trades, community, personal service workers and clerical, administrative workers; and (c) the managers and professionals that peak at level 3.

Which occupation is most characteristic of a skill level?

This question focuses on the characteristics of each of the four levels and how they are typified occupationally. In this case, Table 3 is read vertically. As an example, prose literacy, document literacy and numeracy at level 1 were dominated by labourers; but problem solving at level 1 was dominated by the technicians-trades.

Once again the picture is reasonably consistent. Labourers have the highest proportion of employees at level 1 for three of the four skills; technicians and trades characterise level 2; and the professions occupy the other extremes, dominating levels 3 and 4–5 (see Table 2).

Table 3: Occupations with the highest proportion of employees at each skill level

Scale	Highest Level 1	Highest Level 2	Highest Level 3	Highest Level 4/5
Prose literacy	Labourers 24%	Technicians, trades 20%	Professions 25%	Professions 39%
Document literacy	Labourers 23%	Technicians, trades 19%	Professions 24%	Professions 37%
Numeracy	Labourers 21%	Clerical, administrative 17%	Managers 16%	Professions 40%
Problem solving	Technicians, trades 20%	Professions 19%	Professions 32%	Professions 40%

All percentages rounded; proportions in parentheses refer to the proportion of employees in an occupational group at that level

Is there any difference in the proportion of workers' pattern of skill levels of each occupational group compared with the Australian workforce?

I calculated the expected proportion of workers that should exist when one takes into account the distribution of workers across the eight occupational groups and the four skill levels at the same time. I then compared this with what was observed. This formed a contingency table, from which it is possible to determine the chi-square statistic as a measure of the observed minus the expected differences (a copy of these tabulations is available on request).

For all four skills (prose literacy, document literacy, numeracy and problem solving), there was a statistically significant difference between the existing pattern and what might be expected. This was far greater than might be expected by chance (see Table 4) but, in practical terms, it was not a major difference as it never amounted to more than four per cent in any one instance. All of the largest

differences were in the area of the professions—mainly being over in the actual numbers compared with expected numbers.

Table 4: Chi-square test of observed and expected numbers of workers across the eight occupations and four skill categories (based on the original data)

Skill	Chi-square value	Degrees of freedom	Probability
Prose literacy	1600	21	p<.001
Document literacy	1410	21	p<.001
Numeracy problem	1410	21	p<.001
Problem solving	1490	21	p<.001

Discussion and conclusion

Adult performance below the minimum levels of competence is a common phenomenon. The proportion of employed, adult Australians below minimal competence (at Level 1 or Level 2) varied from 38.6% for document literacy to a high of 64% for problem solving. It is not distributed evenly, but there is a coherent pattern of advantage or disadvantage within and across occupations. Variations over and above chance were noted within and across the four skill levels examined in this paper. The distributions highlighted clusters of occupations across the spectrum of competence.

Throughout this paper, no claim has been made that the *Adult Literacy and Life Skills Survey* was a perfect measure of competence, but it is useful as a starting point and should not be overlooked. It did provide a structured basis for descriptions. At the very least, it offered a common benchmark for intra-national comparisons across the eight occupational groups.

In framing any policy action for adult education and training, some regard might be given to the areas of need within skills. It was always

expected that there would be occupational differences in skill levels and this has eventuated. This analysis confirms that there are pockets of low levels within occupations that policy-makers may seek to address through targeted workplace English programs (see Black & Yasukawa 2010). For example, there is a pattern of greatest need amongst machinery operators/drivers and labourers.

One further phenomenon that is worthy of attention is the substantial overlap in all skill areas between occupations. To my mind, it points to social and occupational inequalities. Put very simply, there are some labourers who are far more competent in all skill areas than other groups such as managers and professionals.

Moreover, there are some skill areas that are worthy of further investigation. The occupational hierarchy in the area of problem-solving skills represents a complex phenomenon that is worthy of further study. It is not clear to what extent this dimension is socially or intellectually biased against those who are unskilled, as this hierarchy is not reflected in the other three skill areas.

Up to recent times the focus of adult labour market programs has been on industry assistance or provision to persons who are unemployed, but there is now evidence that there are also needs within occupations. For instance, 17.6% of professionals are below the minimum level of competence in prose literacy, 18.3% are minimum competence in document literacy, 23% are below minimum competence in numeracy and 43.7% are below minimum competence in problem solving. And this is from the occupational group that was the most highly rated across skill areas. While industry-related programs are contextual, an occupationally focused delivery at the individual level may offer an ecologically valid and possibly more equitable basis for program delivery. Notwithstanding these policy implications, this paper has documented language, literacy and numeracy training needs across the eight major occupational categories.

References

Athanasou, J.A. (2011). 'Is adult reading a guide to educational-vocational achievement?' *Australian Journal of Career Development*, 20(2): 15–23.

Athanasou, J.A. (2001). 'Young people in transition: Factors influencing the educational-vocational pathways of Australian school-leavers', *Education and Training*, 43: 132–138.

Australian Bureau of Statistics (2008). 'Adult literacy and life skills survey summary results Australia 2006 (Re-issue)', Catalogue No. 4228.0, Canberra: Author.

Black, S. & Yasukawa, K. (2010). 'Time for national renewal: Australian adult literacy and numeracy as "foundation skills"', *Literacy and Numeracy Studies*, 18(2): 43–57.

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