

▶ ADULT LITERACY RESEARCH

Thinking beyond numbers: Learning numeracy for the future workplace

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▶ DATA FROM AUSTRALIA and the United States indicate that adults with low numeracy skills are not only economically disadvantaged but also receive fewer opportunities for training and development. However, when such people participate in training, they achieve significant personal and economic benefits. What is not sufficiently well understood is how numeracy skills are best learned in workplaces. This study sought to address this gap in the research.

▶ Methodology

The research included a literature review, semi-structured interviews with a variety of industry representatives and case studies at three worksites:

- an aged care facility with a predominantly female workforce over 40
- a high-tech automotive parts manufacturer with a predominantly male workforce
- a small, traditional, family-owned sheet-metal factory in which technology is increasingly being used.

▶ Definition

Diana Coben, a researcher from the United Kingdom has proposed a definition which was a useful starting point for this study:

To be numerate means to be competent, confident, and comfortable with one's judgments on *whether* to use mathematics in a particular situation and if so, *what* mathematics to use, *how* to do it, *what degree of accuracy* is appropriate, and what the answer means in relation to the context.¹

¹ Diana Coben, 'Numeracy, mathematics and adult learning', in *Adult numeracy development: Theory, practice, research*, ed. I Gal, Hampton Press, Cresskill, NJ, p.35 (emphasis in original).

At the policy and research levels this type of definition of numeracy is understood; numeracy was seen to encompass the application of a broad range of mathematical skills, including the ability to interpret, analyse and communicate mathematically related information. However, amongst those interviewed in this research, this broader view of numeracy was not well understood.

To assist in the collection of data and attitudes to workplace numeracy, the researchers separated the term into component skills, which included:

- measurement
- number calculations
- the understanding and interpretation of diagrams and graphs
- the use of formulae
- the collection, analysis and interpretation of data.

Viewing numeracy in this way enabled the workers, managers and industry stakeholders interviewed to identify the range of numeracy requirements within their workplaces and industry sectors.

▶ Findings

Attitudes to numeracy at work

Workers who take responsibility for their own work areas use many numeracy skills that are often embedded in routine tasks and therefore go unrecognised as numeracy. The skills are usually underpinned by a range of prior learning experiences transferred between workplaces and life situations.



Most workers displayed signs of anxiety when discussing secondary school mathematics education, which they saw as abstract and taught without relevance. These school experiences have commonly resulted in a negative self-image in relation to numeracy, and a consequent lack of recognition of existing ability. Fundamental arithmetic skills of addition, subtraction and multiplication, at which workers were competent, were taken for granted, and other numeracy tasks, such as tallying strategies and calculating freight costs, were regarded as merely part of the job or common sense.

Such implicit use of numeracy skills does not increase workers' confidence about engaging in numeracy training. They need first to recognise what they are already doing as a form of mathematics and thereby realise that they are capable of learning the additional skills required to take on positions of responsibility.

Understanding the scope of workplace numeracy

The initial conceptions of numeracy held by industry stakeholders and managers equated to primary school-level arithmetic skills. When respondents were asked more explicitly about other numeracy skills (for example, use of formulae, interpretation of graphs), most recognised these as necessary for workers in their sectors. It became clear that, while trends towards greater automation mean base-level workers may perform fewer routine numeracy-related tasks, they are being expected to monitor and make judgements about accuracy; for example, of medical doses or mechanised outputs. Judgements such as these require understanding, not only of the measurements, but also of the wider context of their use and importance.

In summary, it was found that workers need to be able to calculate with and without calculators and to have 'a feel for numbers' that allows for approximation and estimation. The findings also reinforce the contextual nature of the methods used for calculations and the specific relevance of numbers and measurements to each work situation. Numeracy skills also play an important role in occupational health and safety. In addition, accurate storage, retrieval, display and interpretation of data are assuming increasing importance.

Training preferences

It was clear that most workers want training that is informal, immediate and delivered on the job by peers or supervisors, rather than anything which reminds them of

the school environment. Industry representatives preferred a combination of 'on' and 'off floor' training, which had immediate workplace application while also incorporating opportunities for practice and reflection. They suggested workplace numeracy training should be framed positively within training for new workplace initiatives rather than being presented as catch-up, or 'deficit model' training.

Delivering the training

To ensure that numeracy skills don't become invisible and hence neglected in the vocational arena, they need to be given prominence in training packages. This can be done by identifying and naming the relevant numeracy skills, as well as their contextually specific application and terminology, along with the vocational skills and knowledge. Underpinning knowledge and strategies for their development should also be spelled out in more detail.

An approach of this kind may also assist vocational trainers to evaluate their own numeracy skills, develop the confidence to support their learners' numeracy learning and alert them to when it may be necessary to work with a numeracy specialist. The study recommends further research into this contextualised but explicit approach to numeracy in training package documentation.

Workplace numeracy training requires input from trainers with both adult numeracy expertise and a sound knowledge of the local enterprise. This might be achieved through a team approach to the training or, if that is not possible, by further professional development of trainers. Moreover, the people organising training, writing competency descriptions and advising on government policy also need to have a thorough understanding of workplace numeracy skill requirements.

Many trainers and vocational teachers are themselves anxious about their mathematical ability and often lack confidence in their underpinning knowledge or their ability to communicate maths-related ideas to learners. Professional development and appropriate teaching approaches could alleviate these issues, as might the team approach.

***Thinking beyond numbers: Learning numeracy for the future workplace* by Beth Marr and Jan Hagston can be downloaded from the NCVET website at <<http://www.ncver.edu.au>>.**

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