

## Introductory thoughts on numeracy

by Dave Tout, Language Australia

### A brief history of the word

A quick look into the history of the word “numeracy” will tell you that the word is very new so it is no surprise that there are debates about what it is and what it means. Its initial use in 1959 was in the UK Crowther Report where it was named as the mirror image of literacy. Different countries have since developed different meanings, and, during the growth and interest in adult literacy provision throughout the 1970s, 1980s and 1990s, there have been changes in the way the term was used.

Regardless of these changes, numeracy has often been cast as the pretender - the junior, inferior partner to mathematics -- because it was seen as just dealing with numbers and the four basic arithmetical operations and doing sums with pen and paper. This was particularly the way it was viewed by the school sector, the general public, the media and often government as well. Because it was perceived as a lesser discipline, practicing ABE teachers also questioned its use as a term to describe their work. There was an attraction to the term mathematics, which while incorporating number skills, also included other strands such as data, geometry, measurement, and even algebra.

However, “mathematics” brought with it many of the negative aspects related to its teaching in schools where it was often taught by rote, outside of any real life context, and was seen as irrelevant, and not understood by many students. Most adult basic education students failed mathematics under this system and return to mathematics education with much trepidation. For them it is associated with feelings of failure, stupidity and powerlessness. To them, mathematics is a competitive and abstract subject filled with lots of work in text books, stressful tests and little explanation of why and how many of the skills are used in society.

Most definitions of numeracy in the 1980s and 1990s have included the use of mathematics in real situations, and the notion that these can be used or addressed by a person in a goal-oriented way, dependent on needs and interests within some context (home, community, workplace, etc.), as well as on beliefs and attitudes. They also recognize that it is important to be able to communicate about math. It is clear from these definitions that numeracy does not refer only to operating with numbers as the word might suggest, but to a much wider range of skills.

### Numeracy in Australia

In recent years, especially in Australia, there has been much discussion and debate in the adult education sector about defining the relationship between mathematics and numeracy

and also about the concept of 'critical' numeracy. Betty Johnston has argued that numeracy in fact incorporates, or should incorporate, this critical aspect of using mathematics. She argues:

To be numerate is more than being able to manipulate numbers, or even being able to 'succeed' in school or university mathematics. Numeracy is a critical awareness which builds bridges between mathematics and the real world, with all its diversity (Johnston, 1994).

She continues:

In this sense ... there is no particular 'level' of Mathematics associated with it: it is as important for an engineer to be numerate as it is for a primary school child, a parent, a car driver or a gardener. The different contexts will require different Mathematics to be activated and engaged in (Johnston, 1994).

So the view of numeracy and mathematics that has developed in the adult basic education sector in Australia sees numeracy as making meaning of mathematics and sees mathematics as a tool to be used efficiently and critically for some social purpose.

Now there seems to be almost Australia-wide agreement that yes, it is okay to use that word "numeracy" to describe what we do – it isn't downgrading, it isn't inferior to mathematics. As stated in the introduction to Adult Numeracy Teaching, "numeracy is not less than mathematics, but more" (Johnston and Tout, 1995).

Parallel to the debate about numeracy versus mathematics, there has been ongoing development of ideas, concepts and theories about numeracy – what it means, how it can be described, and how to teach it.

The current view of numeracy is very different from being just about numbers, and it is a step forward from the meaning that relates to doing functional everyday maths. It is about using and understanding mathematics, all of maths, not just number skills, to make sense of the real world, and using maths critically and being critical of maths itself. It acknowledges numeracy as a social activity, and is why we can say that numeracy is not less than mathematics, but more.

An interesting outcome of this view is that it therefore values mathematics as an important, useful and vital tool in today's society – a bridge between school or traditional mathematics and the real world. It does not ignore the role or importance of mathematics, which unfortunately many people do by their negative attitude where they feel that math is only used by a few very talented and "brainy" mathematicians. Therefore numeracy can be seen as a wider, and more user-friendly, term compared to the traditional term math, and as a useful concept to take forward into the twenty-first century.

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This view of numeracy and mathematics in Australia has had implications for, and made an impact on many, but not all, national and state or provincial curriculum, professional development, assessment and instructional materials. (See Tout, Johnston, 1995)

### **An international view – numerate behaviour**

But further developments need to be considered. For the first time, international cooperation is now occurring on projects such as the numeracy component of the International Adult Literacy and Lifeskills (ALL) Survey. In their working paper, *Adult Literacy and Lifeskills Survey Numeracy Framework Working Draft* (Gal et al, 1999) the authors have extended the concept and meaning of numeracy further. They too have taken the view that numeracy is the bridge between mathematics and the real world, and in considering the mathematical demands that adults face and the skills needed to meet those demands effectively, the authors have arrived at a definition for adult “numerate behaviour” rather than numeracy. According to them, “numerate behaviour is observed when people manage a situation or solve a problem in a real<sup>1</sup> context; it involves responding to information about mathematical ideas that may be represented in a range of ways; it requires the activation of a range of enabling knowledge, behaviours, and processes” (Gal et al, 1999, 11). [[See Table 1.](#)]

Numeracy in the ALL framework has to do not only with quantity and number, but also with dimension and shape, patterns and relationships, data and chance, and the mathematics of change. They argue that people need to identify, interpret, act upon, and communicate about mathematical information; the framework details the ways mathematical information may be represented, and also recognizes that to be numerate, adults need not only mathematical skills, but also literacy and problem-solving skills.

### **Implications for teaching**

In terms of classroom teaching, there appears to be a difference in what you do depending on the view you hold of what you are teaching. If as a teacher you see yourself as teaching math, this often means using a text book, getting students to sit for tests or exams, having students learn more formal math rules by rote, and so on. If your view is that you teach numeracy, you are more likely to teach math from a real life, contextual point of view where math is derived from some actual or modeled activity and where your students can learn through investigations and projects, and where you recognize, support and build upon the student’s own ways of doing math.

It is for this reason that the term used to name and describe what we are teaching is important, and it is for this reason that the term “numeracy” as described above should be

used to describe what it is we do when we teach math in ABE. It is a way forward.

Mary Jane Schmitt recently wrote:

Adult basic education and GED mathematics instruction should be less concerned with school mathematics and more concerned with the mathematical demands of the lived-in world: the demands that adults meet in their roles as workers, family members, and community members. Therefore we need to view this new term numeracy not as a synonym for mathematics but as a new discipline defined as the bridge that links mathematics and the real world. (Schmitt, 2000)

This interest in the new meaning of the word and in the view of numeracy as a way of moving forward is not only happening in the ABE sector. At a recent international math education conference in Japan, Alan Bishop said of numeracy in the school sector:

There is also an increasing interest in numeracy, reflecting both a concern that Mathematics teaching is not succeeding, and also a desire to have a more relevant and context-related mathematics curriculum in schools. (Bishop, 2000)

### **Challenges and questions for the Summer Institute**

Numeracy, not just literacy and language, should be considered a central focus of adult basic education. If this goal is to be realized, adult numeracy education must be supported by research, embraced in practice, and clearly communicated in policy at the national or federal, state or provincial, and local levels.

### **Research**

Research in adult numeracy is thin, so we need to encourage and develop a research culture.

### **How?**

#### **Teacher training and professional development**

The approach, feelings and attitudes about mathematics education are entrenched in its own history. Debate on this issue (Boomer 1986, Siemon 1989) has suggested that teachers need to be challenged and provided with different theories of mathematics education which will change them away from their traditional view of mathematics education. An Australian educator in discussing this issue said:

"While teachers operate at an intuitive level as pragmatists, not articulating to themselves the present theory which drives their practice, they are effectively paralysed in terms of their capacity to change radically. The non-theorised practitioner is a kind of wellintentioned misguided or unguided missile in the classroom, likely to take up a new idea and add it to the repertoire but unable to generate infinite practice for new contexts." (Boomer, 1986)

A large segment of ABE teachers lack the pedagogical and content knowledge adequate to teach adults mathematics – and many are literacy or ESL teachers with little or no training in teaching mathematics. Any change in practice needs to begin by equipping ABE teachers with both pedagogical and content knowledge of numeracy as well as with good instruction techniques, instructional materials, curriculum frameworks, and assessment instruments.

This will only happen through teacher training or substantial professional development. Teachers need to be given a theoretical base on which to give them the confidence and knowledge to move forward.

## **How?**

### **Curriculum, instruction and assessment**

Another crucial aspect of improving practice is the writing of innovative curricula, instructional materials and assessment schemes. Cohesive, comprehensive curricula are needed that will provide students with opportunities for problem solving and communication and that connect with real and important issues in their lives.

## **How?**

### **Policy**

Why has literacy upstaged numeracy in the language of policy making? Numeracy, not just literacy and language, should be considered a central focus of adult basic education. Numeracy should be viewed as a core essential skill, one that is critical for adults in society. The public needs to see the importance of numeracy, not simply mathematics, as a personal resource that can benefit the community at large. Numeracy needs to be brought to the fore.

## **How?**

Some of the ideas for this background paper have been adapted from:

Tout, D. & Schmitt, M.J. (2002). The inclusion of numeracy in adult basic education. In J. Comings, B. Garner, & C. Smith (Eds.), *Annual review of adult learning and literacy* (Vol. 3, pp. 152-202). San Francisco: Jossey-Bass.

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**Table 1: The ALL Numeracy team's elaboration of numerate behaviour. The statement distinguishes five facets, each with several components.**

Numerate behavior involves:

**managing a situation or solving a problem in a real context**

everyday life  
work  
societal  
further learning

**by responding**

identifying or locating  
acting upon interpreting  
communicating

**to information about mathematical ideas**

quantity & number  
dimension & shape  
pattern and relationships  
data & chance  
change

**that is represented in a range of ways**

objects & pictures  
numbers & symbols  
formulae  
diagrams & maps  
graphs  
tables  
texts

**and requires activation of a range of enabling knowledge,  
behaviors, and processes**

mathematical knowledge and  
understanding  
mathematical problem-solving skills  
literacy skills  
beliefs and attitudes.

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1. The authors distinguish between the word “real” and “realistic.” The former implies that real adults are managing real situations in the real world, whereas the latter implies adults operating within someone’s simulation or approximation of the real world.