

## Topic Group B

# Mathematics in community service: developing pathways to build mathematical confidence for good citizenship

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### Session One

The first session considered the paper of Milton Fuller (included in these proceedings). Chris Klinger gave an overview of the paper which outlines the social, participative aspect of adult numeracy education that has formed the basis of a number of curricula over time and place.

### Session Two

During the second session participants fed back examples of the type of provision that has, and is, running that might form the basis for such community provision. It was noted that many governments across the world were funding programmes that linked to employment rather than for broader social concerns. The participants agreed to keep in touch and continue to encourage such work.

## **Mathematics in community service: the challenge in developing pathways to build mathematical confidence for good citizenship**

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*The problem of functional innumeracy in adults has a long history in the literature yet, in reality, little has been accomplished to address its symptoms at a sufficiently deep level. There is considerable literature on school-based mathematics learning and on mathematics support centres in universities but there is a gap in both the literature and public policy about the provision of mathematics support for the broader community. Disadvantaged outcomes in adult life, characterised by dependence on others and an inability to ‘read the world’, follow as a self-perpetuating consequence of under-developed ‘basic’ skills. This is at odds with notions of ‘good citizenship’, whereby fully-functioning adults make reasoned and reasonable decisions as responsible, independent members of society. We aim to prompt debate and generate a renewed interest in aiding the general community to become mathematically literate at a level appropriate (at least) to their needs and aspirations. Specifically, the challenge is to determine ways and means to establish consistent and on-going community support programs. We seek to first identify a practical interpretation of this goal as a means of developing a vision and defining specific objectives. Subsequently, potential models will be explored, along with suggested implementation strategies.*

### **Introduction**

The ‘mathematics problem’ has a long history in the literature yet, in reality, comparatively little has been accomplished to address its symptoms at a sufficiently deep level. For decades, concerns about the numeracy and mathematics attainment levels of children have been expressed regularly in the print media, as have concerns about the preparedness of school-leavers to undertake mathematics- and science-based courses at university. From time to time, industry reports emerge lamenting the numeracy skills of adults in the workforce and, again for decades, newspapers have repeatedly reported on the lack of adult numeracy skills both in the workplace and more generally.

There is considerable literature on school-based mathematics learning and much has been written in the last 20 years on mathematics support centres in universities but, with relatively little exception, there is a gap in both the literature and public policy about the provision of mathematics support for the broader community. The exceptions lie with initiatives such as ‘Skills for Life’ in the UK and the ‘Programme for Basic Competence in Working Life’ in Norway but numeracy is only a small part of the agenda and the

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emphasis seems to be (mostly) on numeracy for vocational, rather than social or democratic, needs. Yet, functional innumeracy in adults is endemic, often characterised by mathematics aversive behaviours stemming from varying degrees of mathematics anxiety and poor self-efficacy beliefs that are typically rooted in poor early mathematics learning experiences or socio-economic disadvantage. Vast numbers of adults lack the mathematical proficiency to help their children with homework, assess the true value, meaning and implications of their financial dealings, or make sense of the array of quantitative or intrinsically mathematical information with which they are bombarded on a daily basis in all aspects of their lives.

We subscribe to the view that quantitative and mathematical literacies are as vital as the ability to read and write in an information-rich democratic society. There is a demonstrably strong relationship between under-developed ‘basic’ skills and impaired opportunities in adult life – adults who are deficient in functional numeracy and literacy skills not only encounter difficulties in going about their day-to-day business, they are also significantly disadvantaged and dependent on others in their inability to ‘read the world’. This serves to perpetuate inequality and is at odds with notions of ‘good citizenship’ (sometimes referred to in the literature as ‘critical citizenship’), whereby fully-functioning adults make reasoned and reasonable decisions as responsible, independent members of their community.

The purpose of the present work is to prompt debate aimed at generating a renewed interest in supporting the general community to become mathematically literate at a level appropriate (at least) to their needs and aspirations. The specific challenge is to determine ways and means to establish consistent and ongoing support programs that will improve the potential for ordinary members of the community to engage in, and explore, the spirit of mathematics as an essential component of good citizenship. As a first step, we seek to identify a practical interpretation of this goal as a means of developing a vision and defining specific objectives. Subsequently, potential models will be explored, along with suggested implementation strategies.

### **Views of the ALM community**

It is clear from a review of ALM International Conference proceedings that many ALM members share our views, at least to various extents and from a range of perspectives. At the inaugural conference in 1994, Jeff Evans and Ingrid Thorstad presented their paper on mathematics and numeracy in the practice of critical citizenship (Evans and Thorstad, 1995). In 1997, Con Power’s keynote address dealt with mathematics for living, arguing that:

Mathematics plays a vital part in the life of the individual citizen as a member of the workforce, employed, self-employed, or unemployed, and also in the life of the citizen who is outside the workforce. Equally, mathematical competencies have a broadly-based relevance for the citizen as a consumer. (Power, 1998)

Power went on to further identify “mathematical issues relative to interest rates, inflation, and exchange rates within the mainstream consideration of the average citizen” (*ibid.*). Since then, several ALM conference themes have focussed explicitly on this aspect of mathematics for adults, for instance:

- ALM-5 Mathematics as part of Lifelong Learning
- ALM-8 Numeracy for Empowerment and Democracy?

- ALM-15 A Declaration of Numeracy: Empowering Adults through Mathematics Education

ALM-12 included a Social Justice Forum (social justice being the theme of that conference's plenary session within the overall theme of 'Connecting Voices in Adult Mathematics and Numeracy: Practitioners, researchers and learners') in which organisers posed the central question: 'If we have a commitment to social justice, what is it in adult maths/numeracy education that we think is worth fighting for?', to which we (the audience) responded with observations that ranged over equity and access (to mathematics and numeracy education), the need to build demand, voters' rights, curriculum decisions and accreditation, life skills versus vocational skills and provision for marginalised groups in small communities.

Within all ALM conference proceedings to date (excluding those of 2003 and 2004, to which we do not presently have access), some twenty or so contributors have presented papers dealing with social and democratic aspects of adults learning mathematics in terms of the need for at least fundamental functional numeracy skills in adults in terms of social justice, opportunity, and citizenship. Table 1 gives results of a lexicographic search of relevant key words/phrases within ALM conference proceedings:

Table 1: Lexicographic search of ALM Conference Proceedings

Key word/phrase	Instances	No. of Proceedings documents where word/phrase found
citizen	176	11
citizenship	187	11
active/critical/responsible citizenship etc	122	9
democracy	224	10
empower/empowerment/disempower...	614	11
social justice	91	7

Note that these results are conservative because (a) not all Proceedings were available to us; and (b) some of the Proceedings documents on hand contained no searchable text. Nonetheless, they are indicative of the extent to which ALM members have identified and expressed ideas that resonate with our present purpose.

There are recurring themes in the literature of our ALM friends and colleagues. Strongest amongst these are discussions of critical citizenship (and analogous terms) driven by the imperative of democracy with objectives in human and social good. Benn observed that:

...in a democracy, adults need to learn mathematics not only to develop skills to generate and solve their own mathematical problems, nor just to gain qualifications. They also need to understand why and how mathematics is generated, used and maintained in our society with concomitant consequences for democracy and citizenship. (Benn, 1997, p. 160)

Such fundamental ideals are closely linked to notions of *empowerment* – that innumerate, or poorly numerate, adults have poorer life chances than those who are more functionally numerate (at least), with attendant risks of social and economic exclusion (Coben, 2002). Moreover, 'poor numeracy skills have a more deleterious

impact on adults' life chances than poor literacy skills' (*ibid.* citing Rivera-Batiz (1994), Bynner & Parsons (1997, 1998), and Bynner et al (2001)).

Related aspects include characteristics of adults considered to be in need of mathematics and numeracy learning opportunities, questions of how to attract and engage them if and when the opportunities are provided, and questions of curriculum and pedagogy – what should we teach them and how should we teach them (and who decides?)

In many respects we are revisiting the themes and questions that arose in the ALM-12 Social Justice Forum, which included the following (ALM, 2006, p. 32):

1. Can we identify ways in which adult numeracy educators can work with others to raise awareness of social justice issues?
2. How can [we] be advocates for the wide range of numeracy learning contexts and programs?
3. How can we influence government policy that affects adult numeracy provision?

Three principle responses were elicited (*ibid.*): we need allies and community engagement “to get people to demand their educational rights...by sharing maths ideas about social justice issues”; we need to raise awareness in social, community, personal, and family arenas while countering the tendency for numeracy to become ‘lost’ as just an issue for vocational training; and we need the “... formation of local networks or clusters to function on a cooperative basis” While this final point was directed towards ourselves as mathematics and numeracy educators and researchers, it is particularly apt for the conversations and ideas that we now wish to pursue in this Topic Group.

## **Vision, questions, and challenges**

### **Vision**

We are convinced that there is a real need to improve adults' quantitative skills (in the broadest sense) in the general community. To that end, we propose the establishment of consistent and on-going community support programs to pursue a social justice agenda of empowerment (in personal, social, vocational, and political senses) by the provision of ready access to mathematics and numeracy learning resources in such a way as to achieve positive outcomes. To be effective, the programs will need to be established so as to motivate people and generate in them the desire to avail themselves of the opportunities that will be offered. That is, we wish to generate a positive approach to increasing functional quantitative literacy by providing pathways that our communities will embrace.

Such is the vision. To begin to give it substance, we believe that the most promising approach will be to establish a network of stakeholders who will contribute as venture partners in various ways best suited to their situation within their communities and to their respective relationships with the citizenry. Prospective stakeholders might be drawn from universities, schools or colleges, local government, industry, and commerce. Each stakeholder would likely have a distinct perspective on the endeavour but each could find reciprocal value in the undertaking. We have in mind, for example, ‘numeracy learning and resource centres’ operating, say, from university or college campuses with expertise provided by those institutions and resourced by public and private enterprises for the benefit of their employees and the broader community as a public good.

There are numerous social, philosophical, epistemological, and logistical questions that need to be asked and answered before such a bold venture can be attempted and it was against this backdrop that we sought input from ALM16 Topic Group participants to begin to explore such dimensions.

## Questions and Challenges

These remain largely open at this very early stage, which was the reason for seeking the views, suggestions, and advice of our ALM colleagues. Rather than set in advance the agenda for discussion, we determined to start the session free from pre-conceptions, beyond the background and vision presented to this point. The first task was to determine major categories (questions) of relevance, which included the following:

1. Just how widespread is quantitative illiteracy in the community? How does it impact on communities locally, nationally, and internationally? What are the consequences?
2. What do we mean by critical citizenship and how/where does mathematics/numeracy fit in?
3. In what (practical) sense might people become more ‘empowered’ by improvements in their functional numeracy and ability to read the world from a mathematical perspective (with or without skills in arithmetic)?
4. If one accepts that there does appear to be a real need to empower members of the community by motivating and improving their ability to ‘read the world’ in quantitative terms, how do we do it?
5. Do people who lack these skills *want* to have the opportunity to improve their quantitative literacy?
6. A ‘Field of Dreams’ scenario (“If you build it, they will come”) seems unlikely, given the wide views of maths being unpopular; how could people be persuaded to attend/participate/engage? E.g. what’s in it for them?
7. Would/should the initiative have a set curriculum; if so, what might it contain? If not, what’s the alternative? Should there be any qualifications/certification etc associated with the activity?
8. What are the pros and cons of establishing industry/government/institutional partnerships:
  - a. suggestions for possible models
  - b. examples of current practices (in numeracy and other areas e.g. ‘Skills for Life’)
9. Is there scope for international collaboration?

Input from Topic Group participants provided a number of key comments with broad scope. A particular aspect was the observation that perhaps school teachers of mathematics are not the most appropriate ‘ambassadors of enlightenment’ when it comes to generating useful quantitative skills in the community. As something of an aside, it is worth noting that was again highlighted by a post-conference press report of the Australian Education Union’s ‘State of Our Schools’ survey, which found that ‘maths, at 28.2 per cent, was by far the largest curriculum area taught by teachers not qualified’ (Hohenboken, 2009). This is, of course, a recurring theme: the lack of preparedness of teachers to teach mathematics at all levels of school mathematics is a perennial problem that is intimately related to the endemic mathematics aversion of pre-

service teachers, particularly those preparing for careers in Junior Primary/Primary teaching (Klinger, 2009). Other pertinent points from the Topic Groups related to:

1. problems in analysing and validating press reports on the lack of quantitative skills in the community;
2. reference to Skills for Life project and the possible role of community colleges and the UK's Family Learning initiative;
3. the importance of nurturing a 'have a go' mentality in the community. This will require an whole cultural shift;
4. the problem of finding funding sources;
5. locating groups where work on innumeracy is already taking place;
6. the problem of getting people to turn up to arranged meetings at specific venues; and
7. finding ways that people with skills in mathematical and quantitative methods can find the mechanisms to assist those who do not have these skills.

One suggested first-step approach was offered by analogy with Johnson's 'War on Poverty' (referring to former US President Johnson):

"What happened was that little pockets of people got funded and our particular thing was run by an anthropologist by the name of Simpson. Simpson's idea was very basic. What he said was, 'We're gonna find out what the needs are. Not a survey. We just simply go out and we talk.' ... the concept was of 'felt needs' – you simply go sit and talk with people and you find out what their community, collectively, not every individual, feels a need for. One community felt the need for a basketball court. Another community felt the need for a kindergarten. Another community felt the need for... alright? Simpson's measure of success was 'scale'. If you can change a person's scale, that's all that counts. And 'scale' doesn't mean 'up the scale', it's a broader spectrum event."

The suggestion was that such a process could reveal opportunities related to community projects, whereby numeracy/mathematics teaching could be embedded somewhat covertly as a critical element of developing community projects:

"Where there's a little room for flexibility, extraordinary things are happening. You don't necessarily hear about them because often the people who are doing them are so involved, spending so much time, that they're not actually writing it up in any kind of systematic way."

"What you were saying about community groups sounds like the kind of thing – you want to go somewhere there is a group already existent, that could be supportive in doing something. It sounds like something that could work. Citizens Advice Bureaux, I'd have thought, would be a place."

"So it's sort of like you slip it in as invisible mathematics – you're disguising the medicine..."

"Like wanting the baseball [sic] court, or wanting this, actually there's loads of maths once you've identified your need."

The notion of changing an individual's scale is very powerful; it is an act of empowerment. Doing so by implanting the mathematics within community projects rather than a direct, frontal 'attack' has considerable intuitive appeal, particularly where experience shows that overt approaches are so often met with resistance.

This theme was echoed in particular references to the funded UK initiative, 'Family Learning', where children are encouraged to attend learning session with members of their family. There, the mathematics is integrated with other topics so that it is not perceived as discrete and unpleasant.

## Conclusion

This feedback from the Topic Groups has added a positive dimension to the task of providing pathways to the community and there does appear to be solid support from the ALM community for generating useful quantitative skills within community groups. Further evidence is provided by contributors to ALM conference proceedings and efforts by university and college projects and special groups working in the community.

A substantial, very real challenge is to change the culture in the community where many people still view any mention of mathematics and anything associated with mathematics with alarm and little interest because of their perceptions that it is too difficult.

A further challenge is the task of seeking out and generating pathways for the community to participate in useful, exciting and personally beneficial activities which will contribute to the development of confidence, not only in being able to apply quantitative methods to personal problems but to also being able to discuss mathematics as an integral part of community activities. This paper is but the first outline of an ongoing project to assist members of the community to better 'read the world' and to echo the words of Terence Tao (2006) in saying, "I like mathematics because it is fun."

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