Introduction

This paper reports on attitudes towards numeracy and mathematics from three sources: professional development events, review of the provision for adult numeracy in England, and research into the role of emotion in adult mathematics education. Arising out of the attitudes identified, from all three sources, conclusions are drawn suggesting a cycle of events evolves that continues to place adult numeracy teaching and learning at a social and political disadvantage.

Two of the sources arise out of the current work of the numeracy team at LLU+ based at London South Bank University (UK) and these are compared to some recent examples of adult numeracy research. The numeracy division at LLU+ plays a unique role in the current development of adult numeracy in the UK. Amongst its current work LLU+ is developing specialist courses for numeracy tutors, revising the Adult Numeracy Core Curriculum, evolving innovative professional development and not least defending the very existence of the term ‘adult numeracy’.

The political context in the UK for these activities can be indicated by the following quotation from an e-Newsletter published by the recently created Department for Industry, Universities and Skills (DIUS), a ministry in the UK government:

Numeracy is one of our biggest challenges if we are to achieve our aim that by 2020, 95% of adults will have functional literacy and numeracy skills as a minimum. An estimated 6.8 million adults are currently below entry level three numeracy compared with 5.2 million adults below level one literacy. This is not acceptable for today's economy let alone the economy of the future and has implications for society as a whole. (DIUS, 2008)

Evidence from Personal Maths Histories

The first evidence presented has arisen out of teacher training and professional development work in numeracy at LLU+. This data was not collected as part of a research project, it was the product of a series of professional development events.

An approach that is a particularly rich source of data about the views of, and attitudes towards, mathematics and numeracy is the recording of ‘personal maths histories’. A personal maths history is some form of account or story of a person’s memory of their interaction with mathematics, numeracy or using numbers in some context. That could be in school, in later education, in work or any aspect of their life. The use of personal maths histories have been discussed by Gillian Thumpston and Diana Coben (1995) and by Alison Tomlin (1999) as part of encouraging discussions amongst numeracy learners about maths and how they learn.
The context in which these maths histories have been collected is different from those described by Gillian Thumpston and Diana Coben and Alison Tomlin. The data reported here was collected within a series of professional development events for non-numeracy teaching professionals in the post-16 sector. The purpose of this activity at the time was to elicit the many social and personal factors that influence, positively or negatively, the acquisition of number skills.

The participants were given time to prepare their personal maths history in a wide range of visual formats. (A copy of the ‘style sheet’ used to encourage imaginative forms of presentation is appended.) These were then displayed around the walls of the room. All the participants had an opportunity to look at each other’s visual account and formal and informal group discussions were encouraged about both the personal and general issues arising.

The personal maths histories were largely visual representations: some made life cycles like a flow chart, some drew graphs and many used little cartoon figures. Though very often some serious and on occasion painful events in people’s lives were presented, an element of humour also crept in. In the ALM15 workshop at which this work was first presented, examples of some personal maths histories were available for observation and consideration.)

After an analysis of about sixty personal maths histories, supported by the observation of many more, the ten key issues identified were as follows:

1. The impact (positive or negative) of key adults in early development of number skills, this is usually a teacher, but may be a parent or other significant adult;
2. The contrast between early learning in primary education and secondary education in ‘maths classes’
3. The very powerful emotions expressed about certain periods of mathematics development.
4. The language of success and failure, particularly with respect to key events, which were turning points in participants’ lives
5. The contrast in language or images used to describe school mathematics and the use of numeracy and mathematical skills in other aspects of participants’ lives such as work or personal money management;
6. The impact of age, gender, social class, ethnic group or country of early schooling;
7. The unexpected opportunity of having space to talk about mathematics as a life experience and genuine interest shown in each others accounts;
8. The association of negative attitudes with school mathematics and positive attitudes with work and home (numeracy/mathematics) activities;
9. Similar accounts of failure and lack of confidence are presented irrespective of the age or level of mathematics at which they occurred
10. Very personal aspects of people’s lives are identified as having a direct impact on number skills development such as a relationship with a father, or a major life decision (eg marriage, house purchase)

It cannot be understated that the significance of these findings is that they are from non-numeracy/mathematics education professionals. Therefore, most of these participants have had success in other areas of learning and professional careers, and have awareness of learning
theories, approaches to learning and skills development. Yet the reporting of anxiety and fear of failure, the disconnection between school mathematics and work and home numeracy are similar to those reported in other studies such as those recorded with adult numeracy learners and undergraduate students (see below).

**Evidence from Practice and Provision in England**

During 2008, whilst these staff development activities were being carried out LLU+ was also collecting a very wide range of information on the provision of numeracy classes and a range of views and attitudes on this provision. The impetus for this information gathering has come from various national agencies, all responding to the the prioritising of numeracy by the Government. The findings from recent reports have built up compelling evidence that the numeracy levels of the adult British workforce are in need of some considerable improvement; such as the Skills for Life Survey (DfES 2003), the Smith report (Smith 2004) the Leitch Report (2007) and the Governments response to the Leitch report (DIUS, 2007).

A study was conducted for the National Audit Office (whose role it is to evaluate the effectiveness of public expenditure on education and skills) into the challenges and issues related to adult numeracy provision and practice. (National Audit Office 2008)

The investigation centered around the following questions:

- Why was it that, in spite of compelling evidence of the nation’s numeracy improvement need, there had been no rush of learner demand for provision?
- Why was it that while providers continued to report shortage of qualified numeracy teachers, there were relatively few numeracy teacher vacancies?
- What were the barriers to personal numeracy improvement at different levels of engagement within the lifelong learning sector (potential learners, teachers, teacher trainers, senior managers)?
- What impact did commitment/non-commitment of senior management have on organisational development of numeracy provision and practice?
- What were the reasons for the apparent shortage of numeracy teachers?

Another project (undertaken for the Quality Improvement Agency) was gathering numeracy-rich information across the strands of the national *Skills for Life Improvement Programme*. (This programme aims to support regional capacity building and workforce development across the lifelong learning sector in England.) LLU+ had a particular role to provide an overview of numeracy across a number of national professional development projects, as well as a direct involvement in the provision of numeracy professional development, particularly aimed at teacher educators. The questions being asked were:

- What are the funding drivers/barriers to increasing numeracy provision?
- What works in terms of promoting numeracy to potential learners?
- What are the challenges of trying to “embed” numeracy in vocational/work contexts?
- What are some effective models of provision?
- How should curriculum be modified to suit learner needs and interests?
- What are some of the numeracy staff development and capacity issues?
What are the pedagogical challenges for particular areas of the curriculum offer—e.g. numeracy provision for bilingual learners?

It is worth noting that the Moser enquiry (DfES, 1999) into basic skills, conducted nearly ten years ago, highlighted the fact that there were more learners at level 1 or below in numeracy than there were in literacy. This lead to various attempts to address the numeracy issue. These activities were many and varied; including national numeracy campaigns, the publication of an adult numeracy curriculum (BSA. (2001), national numeracy test targets, new materials and resources and the development of a specialist qualification for adult numeracy teachers.

The following summary is based on a number of unpublished reports and working documents arising out of the research projects described above; see for example (Chanda 2008).

The findings suggest that the volume of numeracy provision still lags behind that for literacy, and that demand from learners is also less than that for literacy. Potential learners who have engaged in other learning appear to be less concerned about their level of numeracy than literacy, and a fear of maths holds them back from engaging in second chance learning in numeracy. Providers are less inclined to increase numeracy provision because of the apparent lack of demand, and so do not prioritise the building up of numeracy staff capacity. Hence, a general lack of supply of numeracy specialist teachers for when there is some incentive to increase provision. This vicious circle of non-interest and non-action is what keeps numeracy in the shadow of literacy. This hidden existence is further compounded by the way numeracy is submerged within the current nomenclature such as “basic skills”, “Skills for Life” “Key Skills” and “LLN (Language, Literacy and Numeracy)” in the United Kingdom.

There is also a great deal of concern about the quality and competence of those who are in a position to support the numeracy development of the workforce, whether in education, training or the workplace. The received wisdom is that numeracy teachers need to have maths skills at a higher level than originally required for working in this field, and the recently introduced subject specialist qualification for numeracy teachers is evidence of this. Many experienced and dedicated teachers working with elementary level numeracy learners feel that the emphasis is misplaced—they see pedagogy to support diagnostic teaching at this level to be far more important. There is evidence of a resulting lack of demand for numeracy teacher qualifications in some regions in spite of funding incentives. Our research finding is that those non-specialist teachers and support staff now involved in embedding/integrating numeracy are ill-prepared to meet the needs of learners’ habitual errors or misconceptions, and that many are hampered also by the fact that they may themselves be operating on the margins of their own competence in numeracy. A common response to consultation with vocational teachers about the challenges of embedding numeracy in a vocational context was that they could do the maths required but did not necessarily know how to teach someone else the same maths skills in more than one way.

There is also evidence of tension between the perceived needs/interest of learners, the current curriculum offer and the national test targets. This is another vicious circle. Institutional and financial quality control structures need hard evidence of achievement, and the national test has proved popular with learners keen to “achieve” in a subject area that has previously eluded them. However, the push for successful outcomes often leads to learners being tested within their comfort zones of knowledge and skills. More importantly, the comments from industry suggest that neither the national adult numeracy test nor GCSE mathematics are delivering the numeracy skills required in the workplace. The research findings clearly show that in today’s workplace, the usage of maths is more likely to be a sophisticated application of basic maths calculations supported by technology and decision-making supported by sophisticated data analysis tools. The current adult numeracy core curriculum is more traditionally focused on topics and skills rather than process and functionality. Research supports the view that adult learners are motivated by
needs and interests (e.g. helping their children with maths) not all of which can be squeezed into
the “one size fits all” preparation for a national test programme of study.

Most importantly however, the findings point to a national culture of disinterest in mathematics
which has a knock-on effect on adult numeracy. The poor experience of school maths is still a
demon in many people’s psyche. It has been observed that people often regard the maths they do
use as adults as common-sense, not numeracy see for example (Wedege, 2002). This negative
attitude pervades all levels, and results in a range of barriers to numeracy development—from
individuals’ inertia “to do something about one’s numeracy” to organizational apathy about
increasing numeracy provision and actively promoting numeracy to potential learners.

Evidence from Research

There have been many research projects that have looked at attitudes to mathematics including
the emotional reactions to the subject. The work of Gillian Thumpston, Diana Coben and Alison
Tomlin has been referred to above in introducing personal maths histories. Wedege’s (2002)
paper Mathematics—That what I can’t do: People’s affective and social relationship with
mathematics makes the case for this being a very complex area of study and requiring multi-
disciplinary approaches. In this paper she concludes

We know that the affective and social relationships with mathematics is an important
component in an adult’s numeracy. As we have seen, why and how this relationship is
incorporated and changed through life and education is a very complex issue. Finally, this
article has been conceived once more with the dialectic between cognitive, social and
affective dimensions in the learning process, showing that inter-disciplinary studies are a
must in the research and practice of adults knowing and learning mathematics.

In the work of Jeff Evans there is considerable support for the importance of considering the
emotional aspects of learning mathematics and numeracy, but in his case based on substantial
evidence from a series of studies using discourse analysis. In introducing his approach he
summarises ‘conceptualising emotion’ as follows.

I take a unified approach to cognition and affect, to thinking and emotion, in the sense that
affect and emotion are seen as in principle distinct from ideas (the cognitive), but as
nevertheless attached to them, though not in a fixed or permanent way.

. . .

Emotion should be seen as socially organized, not as a simple expression of an individual
characteristic or essence. . . . The perspective I argue for, here and elsewhere, is that the
context of emotional experience is part of that experience: it is formed or constituted
within pedagogic or other practices and the related discourses.

. . .

There are further bases for arguing that emotional states and experience can be seen as
socially and culturally specific. For one thing, emotional states are not just in the ‘here and
now’: they must be understood as based on a person’s history of involvement in practices.
This history itself is structured, for example by the social class of the learner’s family, and
in the case of learning mathematics . . . by the form of pedagogic practices they have been
subjected to. (Evans, 2002)

This places the evidence presented in this report firmly in a research tradition that recognises the
fundamental importance of emotional states and social contexts with reference to the experience
of adults learning mathematics and the development of adult numeracy education.
Christopher Klinger’s paper (Klinger, 2008) describes a study comparing the attitudes towards mathematics between Science and Arts/Humanities students’. In his summary Klinger establishes that

Data analysis revealed that participants who were beginning arts and humanities programmes tended to share the pervasive negative attitudes, low mathematics self-efficacy beliefs, and anxiety of mathematics attributed to the broader population by many previous studies whereas their counter-parts enrolled in science-based programmes had attitudes and beliefs that were significantly more positive.

At the end of his paper Klinger concludes that

This study also flags implications for the much broader issue of fostering improvements in quantitative literacy in society. As indicated in the introduction, this must be guided by the community’s best-informed and most influential members, which must include those with the greatest education. Yet this study indicates that a very substantial proportion of entrants to higher education are afflicted with predominantly negative views of mathematics. Unless the university experience challenges and radically improves their perceptions, it appears unlikely that, as future graduates, they will go on to promote the need for change in math teaching and learning at any level, let alone the sort of profound changes that will be necessary to make a real difference.

This quite clearly shows evidence from a completely different source, a different methodology and different country (Chris Klinger’s studies were conducted in Australia) which identifies the very same cycle of negative attitudes towards mathematics reproducing itself in generation after generation.

Klinger also reminds us that these issues have been under debate for some time and quotes Europe Singh from 1993 on negative attitudes to mathematics.

- Students commonly identify mathematical abstractions and lack of relevance as causative factors for their dislike of and failure in mathematics
- Fear of failure induced by the nature of some mathematics teaching and assessment practices as a cause of anxiety in adults
- The significant influences of teachers to motivate or estrange math students
- Negative attitudes towards mathematics may be more pervasive in the female population
- (quoted in Klinger, 2008)

**Conclusion—The Connection**

What has been established here, in building a picture of the need to improve adult numeracy provision, is the relevance of the attitudes towards, and views of, mathematics and numeracy of all the relevant professionals and managers.

The approach taken here has been to combine an analysis of evidence taken from three diverse sources. These have been one exploring the provision of adult numeracy classes in England, a second recording the views and attitudes of post-16 teachers and a third reviewing some recent research reports on emotional responses to mathematics education. This has exposed a significant confluence of ideas, concerns and conclusions.

A direct link between negative attitudes towards numeracy and mathematics has been identified with the lack of development of numeracy provision (in the UK at least). The outcome of this can be summarised as follows.

- Need to connect better between provision, practice and learner motivation
• Numeracy still in the shadow of literacy and maths—submerged in “Skills for Life” and “LLN”
• Fears and anxiety re maths exist at all levels—from potential learners to senior managers and teacher trainers
• Lack of commitment to numeracy at management level has negative impact on growth of numeracy provision and capacity
• Shortage of specialist teachers, but not many jobs either
• National concern re maths levels of workforce, but apparent lack of concern at individual level
• The need for numeracy support—for teachers and learners—is evident in all settings (education, training, workplace, society)

The presentation of this data in a workshop at ALM 15 (see introduction to this volume) produced immediate recognition and deep concern, though many of those present had no direct experience of the UK context. There was particular concern that the long-standing and deep seated fear of learning mathematics, and the ignorance of adult numeracy, amongst managers and policymakers has for years led to ill-informed decisions about the funding, curriculum structure and availability of courses of adult numeracy.

To complete the circle the report of this workshop, and its supporting evidenced will now itself add to the body of knowledge which it is hoped in time will lead to actions being taken to reverse the cycle of negativity.

References


