



National Research and Development Centre
for adult literacy and numeracy

Research briefing



Numeracy

This is one of a series of publications produced to provide up-to-date summaries of recent research findings from the National Research and Development Centre for Adult Literacy and Numeracy (NRDC) and associated organisations. The series features summaries in each of the following areas:

- Embedding
- Family literacy, learning and numeracy (FLLN)
- Formative assessment
- ICT
- Literacy and ESOL
- Numeracy
- Persistence
- Priority groups
- Progression

Numeracy

Introduction

While numeracy has been the 'poor cousin' of literacy in the past, and still is in many countries, in England Skills for Life (SfL) has made it an equal partner. Numeracy participation and achievement figures are rising each year (Bathmaker and Pilling, forthcoming 2008). However, they still lag behind those for literacy, as does the number of tutors teaching the subject (Carpentieri et al. 2008).

The standard explanation for lower participation in numeracy is that people are not as bothered by poor numeracy as they are by poor literacy. However, new research by the Department for Innovation, Universities and Skills (DIUS) has found that it is not complacency that keeps individuals from participating in numeracy courses, but fear. This is particularly unfortunate given NRDC research showing that in many cases numeracy matters more than literacy (Parsons

and Bynner 2006). This is particularly true for women. Those with poor numeracy were less likely to be in a full-time job at age 30. They were also less likely to be in any form of paid employment (including part-time), and more likely to be engaged in home care. Among those in work, poor numeracy also predicted being in an unskilled or semi-skilled job. At the age of 30 men and women with poor numeracy were more than twice as likely to be unemployed as those with competent numeracy, and men with poor numeracy had the lowest hourly rates of pay. This paper summarises recent research on numeracy by the NRDC and other organisations, focusing on several key topics: numeracy's contribution to social inclusion and economic well-being; numeracy achievement levels; motivation, participation and persistence; effective teaching; financial literacy; and the numeracy workforce.



Numeracy

What the research shows

Numeracy skills affect life chances and ambitions, from childhood into adulthood. For both men and women, having skills below Entry Level 3 appears to greatly impede full economic and social participation (Parsons and Bynner 2006).

Skill levels

The 2003 SfL survey (DfES 2003) found that 47% (15m) of the UK's working age population had numeracy skills at Entry Level 3 or below, with 25% (8.1m) at Entry 3, 16% (5.1m) at Entry 2, and 5% (1.7m) at Entry 1 or below.

Among individuals born in 1970, males and females have nearly identical levels of literacy skills. However, numeracy skill levels are lower for both sexes, especially women. Numeracy levels for British-born men and women aged 34 in 2004 were as follows (Parsons and Bynner 2006):

- Level 2: 31% men / 22% women
- Level 1: 38% men / 30% women
- Entry 3: 19% men / 30% women
- Entry 2 or below: 12% men / 18% women.

Research into numeracy achievement levels over the last few decades offers good and bad news (Rashid and Brooks, forthcoming 2008). While there was a steady increase in the maths GCSE pass rate between 1989 and 2005, in the years 1987–2003 a consistently high proportion of young adults (roughly 22%) had poor numeracy skills.

Rising participation and achievement

However, Learning and Skills Council (LSC) data shows that adult numeracy participation and achievement rose substantially between 2000/01 and 2004/05. Looking at all three SfL subjects over the five-year period, numeracy had the lowest number of enrolments each year, with ESOL second and literacy the most. However, those figures include all enrolments. When only those counting towards the SfL target are taken into consideration, numeracy leapfrogs ESOL and is a very close second to literacy. This is encouraging news, as is the finding that

total numbers for participation and achievement in numeracy rose substantially between 2000/01 and 2004/05. Over the five-year period, enrolments showed an increase of 89%, from roughly 360,000 to nearly 690,000. Achievements nearly trebled, rising from 120,000 to 345,000, with the highest proportion at Level 1, which rose from roughly 46,000 in 2000/01 to more than 200,000 in 2004/05. At Level 2, achievements rose from 59,000 to 89,000. Because the LSC data does not disaggregate achievements and enrolments at the various entry levels, we were unable to ascertain achievement levels at Entry 3, Entry and Entry 1. However, even when combining all three entry levels, achievements were much lower than at Levels 1 and 2, rising from 14,400 in 2000/01 to nearly 55,000 in 2004/05.

Over the five-year period, numeracy enrolments nearly doubled, and achievements almost trebled.

In every year we analysed, women were better represented in numeracy courses than men, both in terms of enrolments and achievements. Taking all five years together, women accounted for 54% of enrolment and 58% of achievements.

Motivation, participation and persistence

The standard explanation for lower participation in numeracy is that people are not as bothered by poor numeracy as they are by poor literacy. According to this theory, for many adults, being 'bad at maths' or 'not having a head for figures' is not only not worth worrying about, it is even something of a badge of honour. However, new market research by DIUS confounds this view, finding that it is not complacency that keeps individuals from participating in numeracy courses, but fear and lack of confidence.

Early findings from ongoing NRDC research indicate that many issues related to engagement, motivation and persistence do not have a subject-specific dimension (Lopez et al., forthcoming 2008). However, in terms of previous learning experiences, numeracy learners said they had more negative compulsory school experiences than ESOL and literacy learners, and were more likely to perceive learning environments that were reminiscent of school as demotivating. Numeracy learners appeared more likely to persist when class work seemed relevant to their daily lives.

Regarding motivations for taking numeracy courses, 16- to 19-year-olds tended to be instrumentalist, saying that they were studying numeracy because their employers told them to or because the subject was required for another course (Coben et al. 2007). Learners over age 20 were more than twice as likely as those aged 16–19 to say that they wanted to study numeracy for intrinsic reasons, e.g. to prove something to themselves, to become more confident, or to help with their lives outside the classroom.

Recognising your own learning needs

For adults to want to improve their literacy and numeracy skills, they must first recognise that they have poor skills and see this as a problem. Such recognition is rare. In regular surveys of cohorts born in 1958 and 1970 (the National Child Development Study and the British Cohort Study 1970 (BCS70)), the proportion of cohort members reporting problems with numeracy has remained consistent at 3–5%. However, in the 2004 BCS70 survey, this rose to 11% (Parsons and Bynner 2006). This figure is higher because, for the first time, respondents were not simply asked if they had general difficulties with numbers, but were asked specific questions about their capacity to perform operations such as multiplication and division. Respondents' reluctance to report general problems with numeracy indicates that many people believe that,

despite some specific problems such as division, their overall numeracy skills do not present significant hurdles, even when those skills are very poor. Motivating such individuals to improve their numeracy will present significant challenges, and is likely to be less straightforward than motivating learners to improve their literacy.

Motivation to engage

That being said, NRDC attitudinal research on the BCS70 cohort offers some promising data, in particular the finding that among those who did report difficulties with numbers, more than one-third of men (35%) and nearly half of women (45%) wanted to improve their skills. This response compares very favourably with attitudes to literacy improvement, where only around one in four men and one in five women reporting difficulties said they wanted to improve (Parsons and Bynner 2006).

Maths4Life and Thinking Through Mathematics

Thinking Through Mathematics (TTM) is a research and development project which attempts to transform educational practices in numeracy classrooms within SfL by helping teachers to develop more 'connected' and 'challenging' teaching methods (Swain and Swan 2007). These in turn enable learners to develop more active orientations towards their learning.

The aim of the research was to study the feasibility and potential impact of these teaching and learning approaches. We found that whereas teachers generally rated their practice before the project began as being learner-centred, their own learners tended to see them as being more teacher-centred. Over the course of the project, the teachers' practice changed, particularly in terms of their organisation (more group work), classroom ethos (learners were more relaxed and felt less worried about making mistakes), and learners' practices (learners were given more choices and encouraged to ask questions). As part of the project, NRDC developed a series of teaching and learning and professional development

Among those who did report difficulties with numbers, more than one-third of the men and nearly half of the women wanted to improve.

activities (see the 'References and Resources' section of this paper).

Despite the fact that some learners had suffered a negative experience of learning mathematics at school their attitudes towards learning mathematics were generally very positive. Most noticed a major change in their teacher's practices, and particularly enjoyed group work.

Embedding numeracy in vocational programmes

NRDC research (Casey et al. 2006) shows that embedding numeracy in vocational programmes can help address motivation and engagement issues and offer significant improvements in achievement rates. Comparing vocational courses that offered four different approaches to numeracy – non-embedded, partly embedded, mostly embedded and fully embedded – we found that qualification rates rose steadily with the level of embedding: from 70% on non-embedded courses to 79% on partly embedded, 90% on mostly embedded and 93% on fully embedded.

Financial literacy education and Skills for Life

NRDC research investigating the range and scope of financial literacy provision has found that in the public sector, provision and accreditation of financial literacy education is patchy and piecemeal, despite the fact that in recent years there have been many new initiatives, albeit mostly on a small scale (Coben et al. 2005). Provision is often linked to basic skills, but many of those teaching financial literacy education lack relevant qualifications. In the private sector, there is little formal personal financial education for adults. Employers

and trade unions generally do not provide or support financial education courses for employees.

Energising and creating potential

Small-scale NRDC action research projects (Coben 2007) found that ICT enhanced numeracy teaching by encouraging a more creative approach and by enabling tutors to produce more professional and appealing materials and activities, which could be more easily personalised and adapted to individual learning needs in time effective ways. Tutors also found that the use of ICT helped to energise their numeracy teaching.

Supporting self-directed learning

Calculators are rarely used in adult numeracy lessons because learners are not allowed to use them in the national tests. However, NRDC action research (Newmarch et al. 2007) shows that if calculators are used imaginatively as part of an integrated teaching and learning strategy, they provide learners with valuable opportunities for self-directed and self-paced learning.

The numeracy workforce

NRDC research conducted for Lifelong Learning UK (LLUK) indicates that of the 6095 staff teaching numeracy in England in 2004/05, two-thirds were teaching at least one other subject, usually literacy (Carpentieri et al. 2008). Of those individuals teaching literacy and numeracy, only 4% were fully qualified in numeracy. Among those who taught numeracy only, however, the situation was remarkably different, with 57% being fully qualified as a numeracy teacher. This group of teachers were the most well-qualified subset of teachers within SfL.

Further analysis of workforce demographics offers encouraging signs for numeracy provision. Whereas numeracy teachers over age 50 tend to be less well qualified than their peers in literacy, this is not the case among younger teachers, who are relatively more qualified. A young, well-qualified numeracy workforce bodes well for provision.

Scope of this paper

This paper draws on a wide body of recent research by the NRDC and affiliated organisations. Below, we briefly describe some of this research.

Illuminating disadvantage: Profiling the experiences of adults with entry level literacy or numeracy over the lifecourse

This report (Parsons and Bynner 2008) analyses data from the 1970 British Cohort Study (BCS70), which follows the lives of all individuals born in a single week in 1970, collecting new data at regular intervals throughout the cohort members' lives. The authors use this data to illuminate the life trajectories of cohort members who, at age 34, had Entry Level literacy or numeracy skills, with particular emphasis on those with skills at Entry Level 2 or below. The results provide a disturbing picture of limited life chances and cumulative disadvantage, both for individuals and across generations.

Thinking Through Mathematics

This worked to improve educational practices in numeracy/mathematics classrooms by helping teachers to develop more connected and challenging teaching methods that would enable learners to develop more active orientations towards their learning. A 'Thinking Through Mathematics' teaching and professional development resource is available via www.ncetm.org.uk

Effective teaching and learning: Numeracy

This report (Coben et al. 2007) presents findings from a major NRDC research project. The report also offers recommendations for effective teaching practice, with the aim of providing material for improving the quality of teaching and learning and for informing developments in initial teacher education and continuing development.

“You wouldn't expect a maths teacher to teach plastering...”: Embedding literacy, language and numeracy in post-16 vocational programmes – the impact on learning and achievement

This research report (Casey et al. 2006) offers compelling evidence of the benefits of embedding numeracy and other SfL subjects in vocational education.

References and further reading

- Bynner, J. and Parson, S. (2006) *New light on literacy and numeracy*. London: NRDC.
- Carpentieri, J. et al. (2008) *The Skills for Life workforce in England: Summary Report*. London: NRDC.
- Casey, H. et al. (2006) *'You wouldn't expect a maths teacher to teach plastering...': Embedding literacy, language and numeracy in post-16 vocational programmes*. London: NRDC.
- Coben, D. (2007) *Greater Than the Sum... Report of the Action Research Project: the Use of ICT in Adult Numeracy Teaching in Scotland, Phase 2*. London: NRDC.
- Coben, D. et al. (2003) *Adult Numeracy: review of research and related literature*. London: NRDC.
- Coben, D. et al. (2005) *Financial literacy education and Skills for Life*. London: NRDC.
- Coben, D. et al. (2007) *Effective teaching and learning: Numeracy*. London: NRDC.
- DfES (2003) *The Skills for Life Survey: A national needs and impact survey of literacy, numeracy and ICT skills*. DfES Research Report 490. London: Department for Education and Skills.
- DfES (2007) *Thinking Through Mathematics: Strategies for teaching and learning (resource pack)*. London: NRDC. Order online: www.ncetm.org.uk
- Lopez, D. et al. (forthcoming 2008) *Motivating Skills for Life Learners to Persist Progress and Achieve*. Coventry: QIA.
- Newmarch, B. et al. (2007) *'Bestimation': Using Basic Calculators in the Numeracy Classroom*. London: NRDC.
- Parsons, S. and Bynner, J. (2007) *Illuminating disadvantage: Profiling the experiences of adults with entry level literacy or numeracy over the lifecourse*. London: NRDC.
- Parsons, S. and Bynner, J. (2006). *Does numeracy matter more?* London: NRDC.
- Rashid, S. and Brooks, G. (forthcoming 2008) *The literacy and numeracy levels of 13- to 19-year-olds*. London: NRDC.
- Swain, J. et al. (2005) *'Beyond the daily application': Making numeracy teaching meaningful to adult learners*. London: NRDC.
- Swain, J. and Swan, M. (2007) *Thinking Through Mathematics: Research Report*. London: NRDC.
- Swan, M. (2006) *Collaborative Learning in Mathematics: A Challenge to Our Beliefs and Practices*. London/Leicester: NRDC and NIACE.

Numeracy

Key points

- New research indicates that for people with poor numeracy, the biggest barrier to participation is fear rather than complacency.
- Numeracy skills are closely correlated with economic well-being. For example, one major study found that men and women with poor numeracy at the age of 30 were more than twice as likely as those with competent numeracy to be unemployed.
- In 2004, numeracy levels for women born in Britain in 1970 were as follows. Level 2 or above: 22%; Level 1: 30%; Entry 3: 30%; Entry 2 or below: 18%.
- In 2004, numeracy levels for men born in Britain in 1970 were as follows. Level 2 or above: 31%; Level 1: 38%; Entry 3: 19%; Entry 2 or below: 12%.
- Of individuals born in 1970, 11% reported having difficulties with numbers. Among those who reported difficulties with numbers, 38% of men and 45% of women wanted to improve their skills.
- Between 2000/01 and 2004/05, participation in LSC-funded adult numeracy courses nearly doubled, while achievements nearly trebled.
- Research has found that embedding numeracy in vocational education greatly increases numeracy qualification rates.
- Two-thirds of adult numeracy teachers teach at least one other subject.

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- East London Pathfinder
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- Basic Skills Agency at NIACE
- Learning and Skills Network
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