

Tackling the challenge of low numeracy skills in young people and adults

This report evaluates the quality of numeracy provision for young people and adults seen in visits between May and November 2010 to 59 providers including colleges, independent learning providers, local authority providers of adult and community learning, prisons and Probation Trusts. Key features of effective practice and the most commonly identified reasons for underperformance are explored in detail. The report also presents the main challenges faced by providers in securing further improvement.

Age group: 16–18 and adults

Published: April 2011

Reference no: 100225



Corporate member of
Plain English Campaign
Committed to clearer communication

361

The Office for Standards in Education, Children's Services and Skills (Ofsted) regulates and inspects to achieve excellence in the care of children and young people, and in education and skills for learners of all ages. It regulates and inspects childcare and children's social care, and inspects the Children and Family Court Advisory Support Service (Cafcass), schools, colleges, initial teacher training, work-based learning and skills training, adult and community learning, and education and training in prisons and other secure establishments. It assesses council children's services, and inspects services for looked after children, safeguarding and child protection.

If you would like a copy of this document in a different format, such as large print or Braille, please telephone 0300 123 1231, or email enquiries@ofsted.gov.uk.

You may reuse this information (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit www.nationalarchives.gov.uk/doc/open-government-licence/, write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

This publication is available at www.ofsted.gov.uk/publications/100225.

To receive regular email alerts about new publications, including survey reports and school inspection reports, please visit our website and go to 'Subscribe'.

Royal Exchange Buildings
St Ann's Square
Manchester
M2 7LA

T: 0300 123 1231
Textphone: 0161 618 8524
E: enquiries@ofsted.gov.uk
W: www.ofsted.gov.uk

No. 100225

© Crown copyright 2011



Contents

Executive summary	4
Key findings	6
Recommendations	7
Background	8
Scope of the survey	8
Policy context	9
The scale of the challenge	11
Institutional priorities and programme design	12
Planning for numeracy on vocational programmes and apprenticeships	12
Planning individualised learning	14
Teaching and learning	15
Teaching strategies to overcome learners' fears	16
Addressing misconceptions and developing understanding of mathematical concepts	17
Involving all learners and developing their independence	20
Making numeracy purposeful	22
Assessing learners' progress	26
Leadership and management	28
Identifying the need and levels of participation	28
Vocational programmes and apprenticeships	28
Discrete numeracy provision	30
Meeting employers' needs	32
Tutor workforce	33
Self-assessment and quality improvement	36
Notes	38
Further information	39
Publications by Ofsted	39
Other publications	39
Websites	39
Annex A: Providers visited for this survey	41
Annex B: Numeracy levels	43

Executive summary

Both literacy and numeracy are fundamental skills, and national data demonstrate that levels of these basic skills have increased over recent years, both for young people attending post-16 education and training and in the working population as a whole. However, around one in five young people still enter the workplace without the numeracy skills they need for success, only around half of 16–18-year-old learners who enter for numeracy qualifications at level 2 are currently successful, and an estimated fifth of the economically active adults in England are still below this level of numeracy.¹

This survey examined the quality of numeracy provision for post-16-year-olds in programmes up to and including level 2 (GCSE equivalent). Between May and November 2010, inspectors evaluated numeracy programmes in 59 providers. These included colleges, independent training providers, local authority providers of adult and community learning, prisons and Probation Trusts. Inspectors looked at numeracy provision that was integrated within part-time and full-time vocational programmes, as well as discrete numeracy courses.

Of the 35 providers that offered full-time vocational provision, only 16 had good arrangements for initial assessment. Weaker providers did not assess the numeracy needs of all their learners on vocational programmes and they did not have a clear strategy for promoting numeracy. The tendency was to 'encourage' learners to take up numeracy, rather than to challenge learners' reluctance to participate in an activity that many had previously found difficult.

In the most effective provision, numeracy skills were developed as part of all post-16 vocational training, as a matter of course and not as an option. In all the providers visited for this survey where learners' needs were well understood and met, numeracy was an integral part of vocational provision and learners made good progress in developing the technical numeracy skills required for their vocational qualification and related employment.

Successful providers of discrete provision worked effectively with other providers and community groups to set up new courses in numeracy for specific target groups or to extend provision to deprived areas. However, the weaker provision focused on teaching disparate topics, following external test specifications too narrowly, and failed to ensure that the provision met learners' personal goals.

¹ Earlier this year, Ofsted published a report on literacy *Removing barriers to literacy* (090237), Ofsted, 2011; www.ofsted.gov.uk/publications/090237. The term numeracy in this report refers to lower level mathematical skills of everyday application. See Annex B for an explanation of the skills required for each level.

Common features of effective numeracy teaching and learning included:

- developing learners' ability to tackle numeracy-related problems by setting them in purposeful contexts
- showing learners how to build on their previous knowledge and skills to develop their understanding
- providing opportunities for learners to work out the most appropriate approaches to problems individually and with other learners
- encouraging learners to tackle their misconceptions by analysing incorrect answers
- developing learners' conceptual understanding of numeracy through activities which helped them reach the stage where they could explain why a specific method worked
- enabling learners to apply mathematical techniques in their training, at work or in their personal lives.

Learners from these successful sessions said that they could see how numeracy related to their careers or everyday lives and were motivated to put in the effort needed to become more adept at tasks they had previously preferred to avoid.

In contrast, the weaker sessions lacked variety, learning was segmented into the acquisition of disparate mathematical skills, and often involved working through repetitive exercises. Learners were typically preoccupied with memorising seemingly arbitrary rules and replicating steps in a method, often without understanding them. They were not encouraged sufficiently to make connections between what they had learnt and to draw on their existing knowledge and understanding in solving realistic problems.

In the 46 providers where relevant information was examined, 78% of the 506 specialist numeracy tutors working within these providers had a generic teaching qualification. However, only 28% had the required qualifications in teaching numeracy at level 5 or equivalent. Only 15 of these providers had more than half of their specialist numeracy tutors with qualifications in teaching numeracy at this level.²

In nearly all the providers visited, quality improvement arrangements, such as the observation of teaching and learning, did not give tutors sufficiently detailed feedback on their practice. Tutors did not have enough opportunities to increase their technical skills in teaching numeracy through sharing good practice and

² In 2001, it became a requirement, for the first time, for tutors and trainers working in further education colleges to hold a teaching qualification. Since 2002, tutors of literacy, numeracy or English for speakers of other languages who work in colleges have been required to hold a subject specialist teaching qualification at level 5. In 2007, it became a contractual requirement that all tutors teaching these subjects on government-funded provision in all types of providers hold a relevant specialist qualification.

frequent access to subject-specific continuing professional development. The potential for the use of information technology was not exploited sufficiently in advancing learners' practical application of numeracy skills or as a resource to develop the teaching skills of vocational and specialist tutors.

One of the most significant challenges in relation to numeracy is to identify and engage the young people and adults who have low levels of numeracy skills but either may not be aware of the numeracy provision available to them, or may be reluctant to participate. The importance of literacy as a precondition of learning and progress at work is widely understood. The challenge is in giving numeracy the same status, so that learners, providers, tutors and employers all see numeracy as essential to achieving vocational qualifications and career and personal goals.

Key findings

- Providers were most effective in meeting learners' development needs in numeracy where they had a clear management strategy to ensure that numeracy was a compulsory component in all vocational courses up to and including level 2.
- Across all the settings visited, initial assessments demonstrated a high level of need for numeracy provision up to and including level 2. In some of the colleges and learning providers, more than 70% of learners started below this level.
- In the most successful provision, learners developed their understanding of underlying mathematical concepts through practical and vocational applications.
- The teaching in numeracy was more successful where providers had developed the role of one or more well-qualified and experienced numeracy specialists to support vocational trainers in planning and delivering learning sessions.
- The majority of the provision judged to be no better than satisfactory for classroom practice and resources focused primarily on disparate topics that were required for external tests. The individual learning plans reviewed at these providers failed to identify clear learning goals that related to the learners' personal aims and career or employment goals.
- Initial assessment of learners' numeracy skills was no better than satisfactory in 19 of the 35 providers of full-time vocational provision visited. The weaker providers either did not assess all their learners effectively, or tutors did not use the results of the assessments in sufficient detail to plan learning.
- Where numeracy remained an option on vocational programmes, literacy and information and communication technology were the more popular key or functional skill options, and managers did not monitor adequately the take-up of numeracy by those who needed this particular skill.
- The providers of the discrete provision visited worked well with local partners to set up new numeracy provision in areas of high deprivation. In particular, family learning and family literacy provided a successful route into numeracy provision.
- Despite a high level of need, the take-up of discrete numeracy provision was low in five of the six prisons visited. In addition, the assessment of numeracy skills for

offenders on probation was not sufficiently thorough in each of the three Probation Trusts visited and the subsequent take-up of courses was also low.

- Thirty-one of the 46 providers where records were sampled had fewer than half of their tutors with the required qualifications at level 5 in teaching numeracy.
- Tutors did not have sufficient opportunities to develop their specialist expertise in the teaching of numeracy or their own knowledge in mathematics above level 2. Providers' quality improvement arrangements did not give tutors sufficiently detailed feedback on the technical aspects of their teaching of numeracy.
- Judgements in providers' self-assessment reports did not differentiate clearly between their literacy and numeracy provision. The weaker reports were not sufficiently evaluative of teaching and learning and they did not identify actions specifically to address underperformance in numeracy.

Recommendations

The Department of Business, Innovation and Skills and the Department for Education should:

- identify strategic priorities which relate specifically to numeracy in the planned review of basic skills provision
- ensure that staff teaching numeracy have greater access to training leading to qualifications in teaching numeracy at level 5 and above, as well as subject-specific continuing professional development.

National agencies responsible for quality improvement in post-16 provision should:

- ensure that they focus on improving tutors' skills in developing learners' understanding of mathematical concepts and helping them relate their numeracy learning to everyday and work contexts.

Providers should:

- have a clear strategy to ensure that sufficient priority is given to supporting learners' development of numeracy skills in all relevant types of provision
- structure all vocational provision, including apprenticeships, so that numeracy is integral to each course up to and including level 2
- improve initial assessment to ensure that it identifies the numeracy needs of all learners, including part-time learners, and ensure that the results are used to plan group provision and individual learning programmes
- ensure that learners work towards a qualification that is suitable for their career aims and at a level that builds on their prior learning
- increase the promotion of work-based discrete numeracy provision to employers and improve the involvement of employers in planning the content of numeracy provision

- improve the quality of teaching and learning in numeracy by:
 - ensuring that individual learning plans identify learners' long- and medium-term personal and career or employment goals and that the short-term targets for numeracy relate directly to them
 - relating learning activities to vocational and real-life situations that are relevant to their learners
 - reducing their reliance on published or electronic worksheets and practice test papers
 - providing a greater focus on teaching learners' understanding of mathematical concepts so that they become more independent in tackling number-related problems and can transfer their skill.
- identify and share good practice in teaching and learning in numeracy across departments and partners in order to increase the expertise of vocational and specialist numeracy tutors and extend the use of high-quality practical resources
- ensure that specialist numeracy tutors have sufficient knowledge in mathematics, as well as appropriate qualifications in teaching numeracy
- make better use of data to assess the recruitment and performance of different learner groups.

Background

Scope of the survey

1. Those who are numerate take for granted the countless times each day that they are able to swap from analogue to digital timepieces, make calculations using money, weights and distances, understand the possible implications of 25 millilitres of rain, and interpret accurately a newspaper headline that suggests petrol 'could go up to £8.00 a gallon'. All these skills, in addition to more specific number skills, are related to most daily work routines.
2. Competence in the basic skills of literacy and numeracy also forms a key measure of employability for those looking either to enter the workforce or who are seeking progression. Gaining confidence in these areas can serve as an essential stepping stone to further education and training and to the development of the intermediate and higher level vocational skills that are taking on increasing importance in a competitive job market.
3. Numeracy provision in the learning and skills sector is delivered in a range of settings and can take a number of forms. In this survey, inspectors visited: 20 colleges of general further education; 14 independent training providers; 16 local adult and community learning providers, including local authorities; six prisons, including a resettlement prison, two women's prisons and a young offender institution; and three Probation Trusts.

4. Depending on each provider's contract with the Skills Funding Agency and/or the Young People's Learning Agency, the following types of provision, up to and including level 2, were sampled during the visits:
- numeracy integrated within full-time or part-time further education vocational programmes, typically leading to qualifications in Key Skills Application of Number or Functional Skills Mathematics (seen in colleges, prisons and adult and community learning providers)³
 - numeracy integrated within the former Entry to Employment or the new Foundation Learning programmes, typically leading to qualifications in Application of Number, Functional Mathematics or the Certificate in Adult Numeracy (seen in independent providers, colleges and local authorities)
 - discrete programmes in numeracy for adults, typically leading to qualifications such as the Certificate in Adult Numeracy or GCSE in mathematics (seen in colleges, local authority providers of adult and community learning, prisons and Probation Trusts)
 - numeracy for learners in employment such as the Skills for Life provision funded through Train to Gain and the Key Skills Application of Number or Functional Skills Mathematics which form part of apprenticeships (seen in independent learning providers, local authorities and colleges)
 - in-class additional support for numeracy and the provision of separate workshops or other drop-in support arrangements for numeracy (seen in colleges, local authorities and prisons)
 - learndirect, online numeracy programmes, leading to a qualification such as the Certificate in Adult Numeracy (seen in one independent learning provider, one prison, one adult and community learning provider and one local authority).
5. The locations for the teaching and learning observed depended on the types of provision. Locations varied from classrooms to vocational workshops in a college, from village halls to health centres for community-based provision, or a 'quiet corner' in a learner's place of work, such as in a care home, a gym club or a building site.

Policy context

6. The last decade has seen an increasing emphasis on numeracy in national policies for the learning and skills sector. Following the Moser report in 1999: *A fresh start – improving literacy and numeracy*, the previous government

³ Functional Skills Mathematics was introduced as a component of full-time vocational programmes on a pilot basis in September 2009 and is planned to replace the Key Skill Application of Number in apprenticeships from September 2012.

launched its *Skills for Life strategy* in 2001, which was revised in 2009.⁴ Skills for Life encompasses provision for adults in literacy and English for speakers of other languages as well as in numeracy. Considerable levels of public funding have been invested in this initiative with funding increasing from £167 million in 2000–01 to £995 million in 2006–07.⁵ The national core curriculum for adult numeracy was first introduced in 2002 and became the basis for teaching and learning in all government-funded adult numeracy provision.⁶

7. The first strategy document in this policy area to be published by the coalition government has singled out underperformance in numeracy as an area of concern.⁷ It acknowledges that at ‘this critical time of economic recovery, we must look for new ways to address the continuing high proportion of adults with poor numeracy skills’. The strategy includes a commitment to ‘fully fund literacy and numeracy provision for those who need it’ and to carry out a review of the delivery of basic skills provision.
8. The development of policy for literacy and numeracy has taken account of the views of employers during this period. Numeracy has featured regularly in surveys of employers’ views on criteria for employability. A survey conducted by the Learning and Skills Network of employers’ attitudes to recruiting young people identified that ‘very few appear to be prepared to give a young candidate an entry-level job unless they have the basics...literacy, communication skills, numeracy and enthusiasm are the most important employability skills in the view of respondents, and a lack of them in a candidate is a “deal-breaker” for many employers’.⁸
9. Two reviews published in 2011 have made important recommendations about numeracy provision. The Wolf report on vocational education for 14–19-year-olds has drawn attention to the importance of good levels of English and mathematics as a necessary precondition of further study.⁹ The numeracy inquiry led by the National Institute of Adult Continuing Education has recommended that the government needs to adopt a new approach which focuses on how adults use mathematics and numbers in everyday life.¹⁰

⁴ *A fresh start –improving literacy and numeracy*, DfES, 1999;

www.lifelonglearning.co.uk/mosergroup/; *Skills for life: changing lives*, DIUS, 2009; www.bis.gov.uk/assets/biscore/corporate/migratedD/publications/S/SkillsforLifeChangingLives.

⁵ *Skills for life: progress in improving adult literacy and numeracy*, National Audit Office, 2008; www.nao.org.uk/publications/0708/skills_for_life_progress_in_i.aspx.

⁶ See: www.excellencegateway.org.uk/sflcurriculum.

⁷ *Skills for sustainable growth*, Department for Business, Innovation and Skills, 10/1274, 2010; <http://interactive.bis.gov.uk/comment/skills/>.

⁸ *Employability skills explored*, LSN, 2008; www.crm.lsnlearning.org.uk/user/order.aspx?code=080044.

⁹ *Review of vocational education – The Wolf Report*, DfE, 2011; www.education.gov.uk/publications/standard/publicationDetail/Page1/DFE-00031-2011.

¹⁰ *Numeracy counts – NIACE committee of inquiry on adult numeracy learning*, National Institute for Adult and Continuing Education, 2011; <http://shop.niace.org.uk/numeracy-counts.html>.

The scale of the challenge

'I didn't bother with maths at school, because I didn't understand how important it would be in the future.'

'It seems to be OK to say you can't do maths and get other people to do it for you.'

'Being good at maths wasn't cool.'

10. The most comprehensive and up-to-date needs analysis of the working population is the *Skills for life survey: a national needs and impact survey of literacy, numeracy and ICT skills* commissioned by the then Department for Education and Skills and published in 2003.¹¹ This survey estimated that in England, 5.2 million adults aged 16 to 65 had literacy levels below level 1 (representing one in six of the working population) and 6.8 million had numeracy skills below entry level 3 (representing one in five of the working population).
11. Overall levels of participation in Skills for Life have increased steadily. Between 2000–01 and 2008–09, 3.25 million working-age adults improved their basic skills by one level and achieved a qualification.¹² However, between 2006–07 and 2008–09, only around half of learners aged 16 to 18 enrolled on numeracy courses at level 2 gained their qualification. Success rates for learners aged 19+ were higher at each level, but attainment at level 2 was also the lowest for this age group.¹³
12. The number of people gaining literacy and numeracy skills serves as a measure of the potential of those in the working population to progress to further training and gain technical and professional skills. The comprehensive analysis of the 'skills deficit' in the Leitch review made the case that technical skills development, in particular at level 2, was critical to the nation's economic

¹¹ *The skills for life survey: a national needs and impact survey of literacy, numeracy and ICT skills* (RR 490), Department for Education and Skills, 2003; www.rwp.excellencegateway.org.uk/readwriteplus/Research. The Department for Business, Innovation and Skills has commissioned a follow-up needs and impact survey which is due for publication in the autumn of 2011. Further contextual information and a summary of research findings can be found in *Adult numeracy: a review of research*, National Research and Development Centre for Adult Literacy and Numeracy, 2010; www.nrdc.org.uk/publications_details.asp?ID=170.

¹² *The data service, post-16 education & skills: learner participation, outcomes and level of highest qualification held*, DS/SFR7, September 2010; www.thedataservice.org.uk/NR/rdonlyres/8D25DE64-8FA6-49B1-B482-14D10CDBB8B1/0/Post_16_Education_June_2010.pdf.

¹³ *Information authority's individual learner record (ILR) returns – ILR 2007/08 and earlier years (F05 final)*, ILR 2008/09 (L05 final); www.theia.org.uk/.

competitiveness.¹⁴ A full qualification at level 2 was defined in this report as five or more GCSEs at grades A* to C including functional English and mathematics or a National Vocational Qualification (NVQ) or Diploma at level 2.

13. The latest data show that in 2010, 81.5% of young people had reached level 2 by the age of 19.¹⁵ This represents a picture of steady improvement since 2004 when the figure was 66.8%. In the most recent estimates of the highest qualification held by economically active adults in England, the percentage qualified to level 2 and above increased from 69% in 2001 to 79% in 2009.¹⁶
14. Both sets of data show improvement. However, the most recent position is one where around a fifth of 19-year-olds about to join the workforce and a fifth of the workforce as a whole are without the level of skills and qualifications that is generally regarded as the platform for success.

Institutional priorities and programme design

Planning for numeracy on vocational programmes and apprenticeships

‘We do maths that is applicable to motor vehicle in the workshop – the gear ratios now make sense to me.’

15. Providers were most effective in meeting learners’ development needs in numeracy where they had a clear management strategy to ensure that numeracy was a compulsory component in all vocational courses up to and including level 2.
16. In five of the 20 colleges visited, numeracy was an integral part of all their full-time vocational provision up to and including level 2, primarily for learners aged 16 to 18. A further seven colleges integrated numeracy skills into the programmes where initial assessment identified a need. However, this strategic approach also required good management to ensure that vocational and specialist numeracy staff received sufficient support and resources to implement it effectively.
17. The quality of teaching and learning in numeracy observed in vocational provision varied considerably, even when numeracy was part of a programme. The teaching in numeracy was more successful where providers had developed the role of one or more well-qualified and experienced numeracy specialists to support vocational trainers in planning and delivering learning sessions.

¹⁴ *The Leitch review of skills: prosperity for all in the global economy*, HM Treasury, 2006; www.hm-treasury.gov.uk/leitch_review_skills.htm.

¹⁵ *Level 2 attainment by young people in England measured by using matched administrative data: attainment by age 19 in 2010 (provisional)*, Statistical First Release (SFR04/2011), Department for Education, 2011; www.education.gov.uk/rsgateway/DB/SFR/s000995/index.shtml.

¹⁶ *The Data Service*, Statistical First Release, March 2011
www.thedataservice.org.uk/statistics/statisticalfirstrelease/sfr_current/

18. Similarly, the discrete numeracy sessions for vocational learners were more effective where vocational tutors had worked with the numeracy tutor to ensure that references to numeracy in the vocational areas were relevant, up-to-date and met industry requirements. The learners who attended numeracy sessions in the classroom with little or no input from vocational tutors tended to report that it was 'still like school because it is difficult to see the purpose of what we are learning'.
19. Four of the 14 independent learning providers visited prioritised numeracy in their planning of provision. At these providers, all apprenticeship programmes included the numeracy skills relevant to apprentices' area of work, even if they already had an equivalent qualification in numeracy or mathematics, recognised by the awarding bodies as a 'proxy' qualification.
20. The following example shows how an independent learning provider with around 90 apprentices joining a programme in each year ensured that all apprentices completed the Application of Number qualification.

Good practice: numeracy for all apprentices

The structure of the apprenticeship programmes in electrical installation, gas installation service and maintenance, and heating and ventilation was key to how this provider had maintained success rates of 100% for Application of Number at level 2. Apprenticeship completion rates were 83% in 2008–09.

All apprentices completed an online diagnostic assessment as part of a package of initial assessments at induction.

- The numeracy tutor, vocational tutors, learning support assistants and apprentices used the results of the initial assessment thoroughly to agree detailed individual learning plans early on in the programme.
- All the above staff collaborated very effectively to plan individual numeracy support that they provided from day one through key skills classes, workshops and some of the theory sessions.
- A member of the provider's staff also provided individual support at work, when needed.
- All apprentices took the qualification in Application of Number, at an appropriate level to their prior attainment, as the reinforcement of relevant numeracy skills in the vocational context provided a good foundation for their future work in these industries.
- The assignments in numeracy were highly relevant to their specific area of work and the standards of work were high in the portfolios reviewed.
- Learners made very effective use of their numeracy learning at work. For example, they reduced potential wastage in materials through applying accurate calculations, and had a good appreciation of why this was important.

What makes it good practice?

By ensuring that all apprentices continued to develop and reinforce their numeracy skills, the provider prepared them well for the numeracy skills that they would need in the training sessions for the rest of the course and at work. The apprentices were very positive about how much they had learnt so early in their courses and how useful this was in ensuring that they were effective in practical and work situations.

Planning individualised learning

21. One of the main purposes of initial assessment is to provide information on the numeracy skills in which each learner has demonstrated competence and on those that probably require additional work. Tutors can then plan individual support and learners know which aspects of numeracy they need to focus on.
22. In the vocational provision visited, most tutors had schemes of work that related well to the requirements of the qualification in numeracy relevant to each vocational programme. However, in the weaker provision, tutors did not use the results of the initial assessments well enough to ensure that they planned learning that met the needs of all their learners. In the better provision observed, tutors made good use of detailed lists of learners' abilities in numeracy and their development needs according to the results of the initial assessments. In these sessions, learners participated well in a good range of stimulating learning activities that tutors had differentiated according to the development needs of each learner.
23. The learners interviewed who were attending the discrete provision visited all had very personal reasons for returning to learning in numeracy in their own time. These typically included gaining a qualification in numeracy to increase their chances of employment, or progression within a job or to gain a place on a training course. Learners also commonly expressed a desire to improve their numeracy skills to help their children or to satisfy a personal desire to improve their skills for their daily lives. However, very few individual programmes seen during the survey were designed around finding out exactly why the learners needed numeracy for their careers and personal lives and then planning individual learning to help them achieve relevant goals.
24. The diagnostic assessments used by nearly all the providers visited listed learners' attainment and gaps according to mathematical topics. Even in the better sessions observed, tutors typically used this approach for identifying learning goals and planning learning activities. The external tests for the Certificate in Adult Numeracy also lend themselves to teaching a more topic-based curriculum and most of the teaching and learning seen tended to be based on helping learners to 'complete' mathematical topics. Typically, the learners interviewed described both their progress and learning goals in terms of topics, for example, 'I've just completed mean, mode and median, now for ratio, and then I should be ready for the test.'

25. Long-term goals in learners' individual learning plans were all too often vague, such as 'improve my maths' or 'get a qualification', whereas short-term targets listed topics such as 'percentages' or 'long division'. The tutors involved were not sufficiently assertive in defining learners' numeracy needs according to their personal goals. The learning plans did not relate the numeracy skills to the contexts in which learners hoped to be applying their skills in the future.
26. For example, a learner who was due to be released after 15 years in prison explained to the inspector that he was slightly nervous about carrying out practical numeracy-related skills on release, such as reading timetables and maps, reading wage slips and working out a weekly budget. However, the individual learning plan for his numeracy course failed to record these personal goals; it simply stated that he was working towards a qualification in numeracy at level 1 and that he needed to work on adding and subtracting fractions and calculating percentages.
27. The main disadvantage of segmenting learning into the acquisition of sets of disparate skills was that learners invariably struggled to see how these skills interconnected when applied to solving problems. For example, a learner observed working on a problem under a chapter headed 'Percentages' could calculate 20% of the value of a scarf costing £8, but struggled when asked to work out the exact cost and the change from £10, because he had 'done adding and take-aways a few weeks ago' and he was not sure which method to use for this problem.

A good adult numeracy tutor:

- has a very good understanding of the practical application of numeracy in everyday and generic work contexts, as well as in specific vocational areas, where required
- explores the practical reasons why learners have returned to learning numeracy and makes these the core of the learning programme.

Teaching and learning

'I can't believe I had the confidence to challenge a shopkeeper who had worked out my 15% discount incorrectly. This was all down to my numeracy class.'

'When I first started my placement in a nursery for my childcare course, my maths wasn't much better than the children's. Now I really understand it and can explain it to the children so that they learn quickly too.'

Teaching strategies to overcome learners' fears

'Talking to other people in the group who are struggling really helps. Sometimes they have a good way of explaining or sometimes I explain something to them and it helps me sort out my thoughts.'

28. Helping learners to realise the numeracy skills they already had and building on these skills was by far the most effective approach to assisting learners in overcoming their previous fear of the subject. Adult learners, in particular, had a tendency to undervalue their existing mathematical understanding and assumed that this amounted to no more than common sense. The good teaching observed helped learners to realise how they could use these skills on their own in their daily lives or at work, as well as during the sessions.
29. In the better sessions observed, tutors were particularly skilled at using praise and constructive criticism effectively; responding positively to questions, however basic; acknowledging the benefit of incorrect answers; and making learning fun by using purposeful and well-designed games, group work and practical tasks. Many of the learners spoken to had not realised how useful it was to explore the reasons for a wrong answer, when they had previously rubbed it out and just tried again, or 'felt stupid'.
30. Collaborative learning was promoted effectively in the better sessions. Learners found comfort and gained more confidence when working in pairs or small groups. The case study below illustrates how learners worked together to help develop their mutual understanding of decimals in a discrete evening programme for learners working at entry level 3 to level 2.

Good practice: collaborative learning

The aim of the session was to consolidate learners' understanding of the relationship between decimal numbers. It started with a brief recap of decimals from the previous week before the learners were given a pack of 10 cards with decimal numbers between 0 and 1, for example, 0.25 and 0.05, to sort in order. All members of the group had to agree the order so that they could place all the cards in the correct sequence on a number line of about 1 metre long that was marked '0' at one end and '1' at the other.

- The tutor observed the group and only intervened to ensure that each member of the group had enough chance to contribute or to provide useful prompts to move the discussions forward.
- Where one learner was finding it very difficult to grasp why 0.4 was bigger than 0.09, the tutor allowed the other learners in the group to provide an explanation that the learner could understand.
- The explanation that helped that learner was: 'Think of it as money: $0.07 = 7$ pence and $0.3 = 0.30 = 30$ pence; 30 pence are more than 7 pence.'

- The other learners also found this a useful explanation.
- The first learner went on to contribute well to the task and could extend the concept to cover 1/100s and 1/1000s.
- The next activity involved using hexagonal puzzles where each hexagon had different quantities, such as '0.25' and '¼' written along the edge. The learners were required to match up pairs of cards according to the quantities written on them to create a tiling arrangement. This activity built on the previous work on sequencing decimals. It also revised previous work comparing decimals and fractions.
- This activity generated more good discussion and learning.
- The tutor noted that the first learner was able to use his new learning in a different context.

Why was it good practice?

Working in a discussion group meant that the learners had to clarify their own reasoning and find a way to explain their methods. The tutor gave enough time and space to enable learners to think through the task to tease out and clarify misunderstandings themselves. The tutor therefore resisted the temptation to provide the solution too quickly.

31. However, not all the tutors observed saw the benefit of pair work or developing learners' skills and confidence in talking about numeracy. In the weaker sessions observed, tutors did not provide opportunities for the learners to work out problems together. In these instances, the tutor dominated the session by giving long complicated explanations that the learners struggled to understand and was too quick to give the correct answers when learners hesitated to respond to questions, thus suppressing their thinking.

A good adult numeracy tutor:

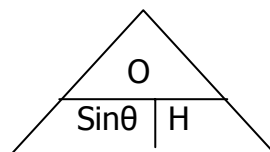
- explores with each learner why he or she may have struggled with numeracy in the past
- ensures that all individualised learning programmes identify and build on the skills that learners bring with them
- incorporates the numeracy skills that learners may use every day, such as adding and subtracting decimals when using money, which they may not realise involves mathematical thinking.

Addressing misconceptions and developing understanding of mathematical concepts

'When did you turn the first or the second fraction upside down? – I never knew.'

'What about two minuses make a plus? – they never did when I tried it.'

32. For learners to use numeracy successfully, they need to make sense of the mathematical concepts and assimilate the written rules and techniques, so that they can use them independently and apply them confidently in different contexts. However, enabling learners to understand mathematical concepts and explain reasoning were the weakest aspects of the teaching observed during this survey. One of the most common frustrations that the learners interviewed found on returning to numeracy was that they 'kept on forgetting the methods' and 'couldn't make sense of all those rules from one lesson to the next'.
33. Weaknesses frequently observed in the teaching centred on the tutors' lack of expertise in identifying learners' misconceptions and helping them understand where they had gone wrong in tackling specific numeracy skills in the past. The negative views that learners identified concerning numeracy were all too often based on frustration at not getting the answer right and not understanding how a calculation or process works. For example, one learner struggled to see why 4^2 did not equal 8 and had clearly not grasped the concept of squared numbers.
34. In the weaker sessions, tutors focused too much on giving learners opportunities to practise a specific numeracy skill often in the hope that they would eventually get the answer right, with insufficient checking of whether the learners had understood the reasons underpinning it. The result was that all too often the learners were only able to carry out the calculations with heavy reliance on the tutor, text books or guidance notes in worksheets. Weaker practice also lacked clear explanations and failed to build on learners' prior knowledge. For example, in an observed session for learners working towards level 2, the class had been taught to transpose simple formulae using a spatial 'cover-up' method that involved variables set out in a triangular configuration. Learners were told to form a triangle and put the part of the formula which equalled the others together at the top of the triangle and 'cover up' the variable they wanted as the subject. For example, $\text{Sin}\theta = O/H$ can be expressed as:



35. There was no explanation of transposition of formula by maintaining the equality of 'both sides' of the equation so that, for example, $\text{Sin}\theta = O/H$ can be expressed as $H \times \text{Sin}\theta = O$ by multiplying both sides by H . At the end of the session students could perform operations, but many of them clearly did not understand the mathematical concepts behind the 'cover-up' rule.
36. In the better sessions observed, tutors promoted the sharing of mathematical reasoning rather than just the solution or the correct answer. In particular, they asked questions that required an explanation rather than mere recall. They also took time to talk through a calculation or a problem with learners to help them

unravel their thinking and to work out where and why they could tackle the task differently. As one adult learner who had 'finally understood' how to 'borrow and pay back' for subtractions commented, 'The tutor knows me as an individual, how I think, and what is more likely to work for me.'

37. An example of very good practice in developing learners' understanding was seen in a session for entry level 3 learners in a discrete adult numeracy class.

Good practice: developing learners' conceptual understanding

The planned learning outcomes were to read, write and understand common fractions and to add and subtract sums of money. The topics were 'pizza slices', and planning and budgeting for a party.

Particularly strong features included:

- good use of directed questioning and illustration on the whiteboard to link numerical and verbal descriptions of fractions using pizza slices as the model (for example, linking 'half' written as a word and as a numerical fraction)
- the tutor took the opportunity to reinforce/improve spelling (for example of 'quarter' – misspelt during an individual activity)
- the tutor used questions progressively with images on the whiteboard to develop conceptual understanding of fractions; for example, 'could you share the pizza equally between two people if it was cut like this?' (into 2, 3, 4 parts and so on)
- the tutor gave the learners time to think, respond and self-correct, and established with them the equivalence of $\frac{2}{4}$, $\frac{3}{6}$ and $\frac{1}{2}$
- very effective use was made of cards in the shape of sectors of a circle to establish the relative size of fractions, relating this to pizzas: 'Why is $\frac{1}{8}$ the smallest of these fractions?' brought the response, 'because you would have the smallest portion of pizza to eat if it was cut into 8' – the learners therefore used the visual prompts to understand the relationships between the different fractions.

Why was it good practice?

Understanding of equivalence of simple fractions was developed securely through the use of the practical context. The tutor employed very good use of probing questions, visual reinforcement, and promotion of peer support to develop conceptual understanding of basic mathematical knowledge. Learners were engaged in activities and learning through 'real life' examples; they were enjoying their learning, and able to apply what they had learnt.

38. Other successful approaches to introducing mathematical concepts observed involved:

- keeping explanations simple and making the context relevant to their personal lives, such as using everyday objects when explaining the differences between two- and three-dimensional shapes
- helping learners overcome the misconception that there was only one method or approach to solving a problem
- suggesting alternative approaches and methods if one did not work for a learner, such as using different methods for long division; learners were often relieved to be 'allowed' to forget the system that had never worked for them in the past and to try different methods.

39. The learners interviewed who attended the learndirect provision visited, in which they spent at least 90% of the time working with online learning materials, had a variety of views on what was the most challenging aspect of numeracy. The common theme, however, was associated more with the ability to understand the question, for tests and online material, rather than what they were trying to achieve in a particular mathematical technique, such as the concept of a 'discount'. Although tutors were available to provide direct support in 'mini sessions', not all staff in these providers were numeracy specialists. This meant that not all learners had adequate opportunities to explore their understanding of the concepts that they were using in sufficient depth when carrying out the activities on computers. They were also unable to gauge if they had indeed grasped the concepts correctly.

A good adult numeracy tutor:

- has developed his or her own understanding of mathematical concepts beyond level 2
- is very skilled at ensuring that learners get to the root of any misconceptions they may have so that they understand where they go wrong and apply the correct reasoning in the future
- promotes the benefits of analysing incorrect answers to learners.

Involving all learners and developing their independence

'In my class we don't all do percentages the same way – we use whatever method works for us.'

'I really like the way the tutor does not give us the answer if we are stuck, instead he gives us alternative examples to help us work out the solution, making it more of a challenge.'

40. Nearly all the numeracy sessions observed on vocational programmes and in discrete provision involved teaching learners of mixed ability. Even on courses streamed according to learners' overall levels, learners brought with them very

different prior experiences of learning numeracy. In the good and outstanding sessions observed, tutors were skilled at using questions and group work to ensure that all learners participated in activities that were at an appropriate level. Conversely, in the weaker practice the tutors did not direct questions sufficiently and waited for a correct answer before moving on, often leaving the same few learners to call out the answers. Some learners were not sure which answer was correct and those learners giving the wrong answer did not find out what was wrong with their offering.

41. In the weaker sessions observed, worksheets of repetitive 'sums' were used at the expense of developing learners' problem-solving skills. Published worksheets were useful to reinforce learning and give learners practice related to written tests, but tutors needed to assess more carefully the purpose of worksheets in helping learners to develop the ability to apply their skills in practical contexts. They also needed to review the quality of the worksheets they used. Although worksheets or text books used by many of the providers visited included real-life examples, some were dated.

42. Nearly all of the colleges visited used learning support assistants; adult and community learning providers had volunteer tutors and prisons used peer tutors. However, the effectiveness of the deployment of this additional support varied considerably. Effective use of additional support tutors that inspectors observed had the following characteristics:
 - detailed, shared planning for all the activities in the sessions
 - clearly identified roles for the lead tutor and each member of the support team
 - support that enabled learners to develop their ability to carry out the calculations or solve number-related problems independently
 - tutors and support staff who were skilled at judging when to provide close direction and support and when to allow the learners more time to tackle a task alone
 - good use of additional work to allow slower learners to build their skills for the main task
 - good use of additional work for the more able learners to allow them to develop a wider range of skills or to apply their skills in a wider range of more complex tasks.

43. The sessions observed that were successful in developing learners' independence in improving their skills in numeracy focused on ensuring that learners used their understanding of 'the why' as well as 'the how' in carrying out calculations and solving number-related problems. Examples of techniques for developing such independence included:
 - instilling confidence in learners by teaching them to apply checks to their calculations so that they knew, rather than hoped, that they were correct

- helping learners to identify reference points for measurements that they would always remember, such as 1.8 metres for the approximate height of a door, or the span of their hand, that for one learner measured eight inches or 20 centimetres
 - using vocational or everyday projects to develop learners' problem-solving skills that they could apply at work or at home as additional 'homework'.
44. Across all types of provision visited, the use of computers varied from highly productive to ineffective. For example, learners readily engaged in the productive use of the internet to research information for a project or activity, or their job. On the other hand, extended use of electronic worksheets did little to develop learners' independent thinking in numeracy, although most of the learners spoken to said that they liked the instant feedback on their efforts when using the computer. Inspectors saw very few imaginative uses of the internet such as online shopping and exploring charts, data and percentages, to help learners to use computers to increase their numeracy skills. Where it was used well, this helped learners to extend their use of computers in their personal lives or at work. Computer programmes generally worked well for learners who were working towards a qualification. However, some learners said that they felt quite isolated working at a computer and would prefer more in-depth support from a tutor.

A good adult numeracy tutor:

- uses different types of activity, such as group, pair or individual work to allow learners to explore mathematical problems or calculations to develop their understanding and confidence
- uses a wide range of resources, including information technology, to develop learners' ability to use their learning independently and in contexts that are relevant to them.

Making numeracy purposeful

'I like doing numeracy when it's part of my course. In carpentry and joinery, we use calculations to see how much timber we need to cut.'

45. The most successful sessions observed during the survey were those for learners on vocational programmes which were set in their vocational contexts, either at the learners' workplaces or in vocational workshops in colleges or prisons. Typically planned and/or taught by vocational and specialist numeracy tutors together, learning involved work on discrete number-related skills and concepts in activities that were linked closely to practical activities at work or in training workshops.

46. The following case study provides a good example of a catering session at level 1 for 16–18-year-olds attending a college, in which the teaching and learning of catering skills involved the development of learners’ numeracy skills.

Good practice: teaching numeracy on a catering course

In the observed activity learners had to prepare a dish within a given time. Many of the learners struggled with adding and subtracting periods of time, but they were motivated to develop their understanding in order to achieve the activity. The tutor used the whiteboard in the kitchen to draw timelines to help develop learners’ skills in planning time. The one learner who presented his dish late could clearly identify that he had switched the oven on too late and was delayed by three minutes waiting for it to reach the correct temperature. The learners told the inspector that the activity revised the skills they had learnt on the course: to weigh out ingredients accurately, multiply the amounts in recipes to cater for larger numbers and proportion dishes according to the number of covers. They felt proud that they were beginning to take these skills for granted although they were aware that they would still need to work on their numeracy skills when they progressed to level 2.

What makes it good practice?

The session plan had clear learning objectives for numeracy. The tutor integrated numeracy into each aspect of the activity, building on learners’ prior learning. The tutor had records of each learner’s ability against these numeracy skills and gave learners feedback on their use of numeracy to complete the catering activity.

47. The survey visits to observe and interview learners at work and in vocational training workshops provided a rich set of good practice examples of the skills in learning work-related numeracy that they had acquired.

- In business administration learners were able to:
 - interpret averages, such as mode, median and mean to work out the number of telephone calls received at work by each department and present this to senior managers in a report
 - calculate decreases in stock after a busy weekend and use this information to monitor stock and change orders.
- In construction, learners developed numeracy to:
 - calculate how many bricks were needed for a wall of a specific height and length
 - measure an area of land for a surveying project, on the basis of which they would then plan the construction of a new building.
- In care for the elderly, learners developed numeracy to:

- measure, record and compare the weight of residents over time
 - estimate the temperature of bath water
 - manage the residents’ daily domestic budgets on their behalf.
48. The following case study shows how women in a prison developed the numeracy skills they needed to achieve a qualification in active healthy living at levels 1 and 2.

Good practice: developing numeracy skills required to work in a gym

Ten learners were enrolled on the part-time six-week course that took place in the prison’s gym. They were working towards an initial qualification in active healthy living that could lead to a higher level qualification in becoming a gym instructor. All learners needed to have developed basic numeracy skills such as addition, subtraction and the use of simple measurements prior to joining the course. A gym instructor taught the class with the help of a peer mentor who had achieved a qualification in numeracy at level 2 and was a qualified gym instructor.

The session involved an analysis of each piece of equipment used in fitness gyms, the range of exercises that each one offered, and the relevant health benefits, as well as the health and safety issues. During the group discussions, learners developed numeracy skills relevant to a gym, including:

- assessing and recommending the optimum number of repetitions in each type of floor exercise
- understanding metric and imperial measurements according to the calibration of each piece of equipment
- using distance and time to understand and compare the readouts on equipment such as treadmills and rowing machines
- using equipment to measure their heart rates and using percentages to work out the optimum heart rate for each type of exercise.

They also needed to record the above types of information in a workbook as they used the equipment in the gym or helped other women new to the gym.

What makes it good practice?

The learners made very good progress in developing numeracy skills that most of them had struggled with in the past. They enjoyed carrying out number-related tasks that had a clear purpose and where the results were very useful for their work in the gym. They quickly realised the need to be accurate in their calculations, and although they used a calculator to work out percentages, they developed the skills in estimating to check that they were giving correct advice.

The support that the peer mentor provided was very well received as the learners said that they could relate well to the explanations given by another woman who had also learnt to use the gym in a prison.

49. However, in the weaker sessions in all types of provision, explanations and activities were only loosely connected to the relevant context, and this often did little to motivate and interest learners. Similarly, activities failed to inspire learners when they did not help them to learn the specific skills they had identified as a priority for them. For example, an apprentice interviewed in a care home felt that the session on measuring weights had not helped her understand how to use scales in the kitchen to weigh out food for the residents with diabetes.
50. The tutors on discrete programmes who were interviewed felt that linking teaching in numeracy to contexts that were relevant to all learners was a challenge, particularly where learners were of mixed levels and had very different interests and learning goals. Some successful examples observed in sessions involved good development of learners' skills in financial literacy, time management and handling data:
- planning an outing that involved reading information sheets about opening times, maps and timetables, working out timescales and calculating costs of travel, entrance fees and refreshments per person
 - selecting the most beneficial savings scheme or understanding pay slips or benefit schemes
 - discussions on the national budget deficit to help learners understand and use large numbers.
51. The tutors in these examples used a good selection of activities at different levels to ensure that all learners were fully involved. The weaker sessions seen did not offer learners sufficient opportunity to develop and transfer their skills into meaningful contexts.

A good adult numeracy tutor:

- focuses on problem-solving and applying numeracy to build learners' confidence in using it in everyday situations and at work and help them understand the practical purpose and application of each mathematical concept
- minimises the use of paper-based and electronic worksheets
- uses a wide range of practical resources, including technology, in an imaginative way to develop numeracy skills that relate directly to those that learners use in everyday situations, at work or for personal projects or hobbies.

A good vocational tutor who supports learners' development of numeracy:

- has developed his or her own understanding in mathematics to at least level 2
- has a qualification in teaching adults in the lifelong learning sector
- has a very good understanding of the practical application of numeracy in the relevant vocational area
- ensures that all learners have individualised learning programmes that identify and build on the numeracy skills that learners bring with them, that are relevant to the vocational area
- is skilled at ensuring that learners get to the root of any misconceptions they may have so that they understand where they go wrong and apply the correct reasoning in the future
- focuses on problem-solving and applying numeracy to build learners' confidence in using it in training and at work
- helps learners understand the practical vocational purpose and application of each mathematical concept
- sets high standards to ensure that learners can perform relevant mathematical or number-related processes accurately and competently to the required industry standards.

Assessing learners' progress

'When the tutor first assessed my work, she asked if I thought I'd got it right. I thought this was daft at first, but now I know it's up to me. I should know if I understand something well enough. Then the tutor can help me spot any silly mistakes.'

52. Effective assessment in numeracy goes beyond simply confirming if final answers are correct, to checking learners' understanding of how numeracy methods work and why. In the better sessions observed the tutors did not always rely on using question and answer sessions or written exercises for assessment; instead, they used problem-solving activities that enabled the learners as well as their tutors to assess their progress and to identify where they were still grappling with concepts. Effective tutors continuously assessed the progress of their learners during sessions, and quickly adjusted their teaching methods in response.
53. In the more effective provision visited, vocational tutors and numeracy specialists worked well together to develop vocationally related assignments for

the Application of Number qualification. These assignments linked well to the criteria for the qualification and featured good examples set in the relevant vocational contexts. All the providers visited were developing teaching, learning and assessment materials for functional mathematics.

54. In less effective provision, there was often too much focus on summative assessment at the expense of formative assessment during teaching sessions. In the discrete provision visited, targets for the achievement of qualifications were frequently a strong focus for tutors and managers; assessments focused on identifying the topics that the learners had completed and concentrated on those that still needed to be covered for the tests. In one typical example, managers had set up six-week courses that had to include two practice papers for the external tests, and the final test to be taken by at least two thirds of the learners. This allowed little or no time for exploratory problem-solving activities to help learners try out different methods of tackling problems and assess their own progress in working out the best way to resolve them. Tutors therefore had reduced opportunities to understand specifically what barriers to learning they needed to address.
55. In the discrete numeracy classes where the main focus was working through practice papers and exercises based on the way test paper questions were set, the feedback that learners received was very narrow. In these courses, learners' diary pages, which were used for recording their progress after each session, were largely uninformative and unhelpful in identifying their achievements and the barriers to them moving forward. In these sessions, the system for recording activities, and frequently the activities themselves, did not help learners develop the technical language they needed to assess and describe their performance. Records of learners' progress frequently featured the following characteristics:
- comments under the heading 'work completed' regularly listed topics such as 'adding', 'probability', or 'algebra', or even stated 'L1 practice paper' or 'exercises 4–8 on p36'
 - learners' written comments tended to focus on their attitudes and efforts: 'I enjoyed this exercise' or 'I worked hard' or 'I just couldn't concentrate today'
 - tutors' comments were invariably encouraging but often unhelpful in recording learners' achievements in sufficient detail to help them improve on their performance: 'Good work' or 'Good progress'.
56. Inspectors saw few very good records of learners' progress, but when such records were found, they were much more explicit and the learners were more fluent in describing their progress and achievements.
- 'I can understand borrowing and paying back for subtraction after 30 years'

- 'I have at last accepted that you don't need to work everything out exactly and I'll round numbers and amounts up or down more now to get a rough answer'
- 'I'm more accurate at drawing and measuring angles.'

A good adult numeracy tutor:

- continuously assesses the progress of his or her learners during sessions, and quickly adjusts his or her teaching methods accordingly
- provides constructive feedback on learners' progress in understanding individual mathematical concepts, as well as their progress towards personal learning goals
- focuses primarily on developing learners' knowledge, skills and understanding, but also ensures that they are familiar with the requirements of external assessments and tests.

Leadership and management

Identifying the need and levels of participation

Vocational programmes and apprenticeships

57. Initial assessment provides information on a cohort of learners' levels of attainment in numeracy at the start of each course. Managers can use this data to monitor the level of need in the institution as a whole and to decide how best to organise numeracy support for every course.
58. All the 35 providers visited offering full-time courses used initial assessments in numeracy (and literacy) for at least some of their vocational programmes. Ten colleges, six independent learning providers and one local authority had good arrangements for initial assessments. They systematically assessed all their learners as they joined a vocational course and they used the information well to organise numeracy provision at course level, as well as for individual learners. In the weaker providers, where learners were not assessed or where they did not receive the results, they did not know whether they had the numeracy skills required for their training programme. This included apprentices who had an approved 'proxy' qualification in numeracy or mathematics, but may not have been sufficiently competent in the numeracy skills required at the start of their vocational programme.
59. Across all the settings visited, the results of initial assessments at institutional level that were reviewed showed a high need for numeracy provision up to and including level 2. Typical results reviewed showed:

- college A: 87% of the 1,217 learners aged 16–18 joining a vocational programme in September 2009 were assessed at below level 2; 30% were below level 1
 - college B: 71% of learners aged 16–18 joining a vocational programme in September 2010, were assessed at below level 2; 23% were below level 1
 - independent learning provider C: 71% of 86 apprentices starting in September were assessed at below level 2; 15% were assessed to be below level 1
 - independent learning provider D: 81% of apprentices were assessed at below level 2; 32% were assessed to be below level 1.
60. Meeting learners' numeracy needs was found to be far more variable in the colleges visited where numeracy provision was not a formally scheduled part of a vocational course. For example, in three of the 20 colleges visited, course tutors or learners were allowed to select one from three key skills subjects in each year of a one- or two-year course; participation data showed literacy and information and communication technology (ICT) to be more popular than numeracy. Some of the staff interviewed said that learners often came to courses with negative experiences of numeracy, and so literacy or ICT were their preferred options. They also felt that as success rates were higher in these two subjects, numeracy was often the third choice for managers and staff too, regardless of the results of the initial assessments. In these colleges, senior managers had not set clear criteria or established guidelines to ensure that curriculum managers selected the most appropriate key or functional skills to meet learners' development needs and prepare them for employment and further training.
61. The national key skills data for 2008–09 showed that 33% of registrations for key skills qualifications at level 1 were for Application of Number, 42% were for communications and 25% for ICT. At level 2, only 23% of registrations were for the qualification in Application of Number, 47% were for communications and 30% for ICT.¹⁷
62. In addition to provision in key or functional skills, all the 20 colleges visited gave learners identified as having low levels of numeracy a choice of additional support from specialist numeracy tutors, involving additional discrete courses or drop-in support sessions. However, take-up of this type of support generally relied on learners' motivation or the enthusiasm and support of their tutors. Take-up was low where learners' reluctance to develop their numeracy skills was not challenged effectively. Learners who had opted not to take up support to help them fill their identified gaps in numeracy skills often told inspectors that they felt there was still the option to continue to muddle through without the numeracy skills they needed for their main area of study.

¹⁷ Information authority's individual learner record (ILR) return, ILR, 2008/09 (L05 final); www.theia.org.uk/.

Discrete numeracy provision

63. Most of the providers visited reported increased numbers of learners on discrete adult numeracy courses in recent years. For example, one local authority said that its recent local economic assessment had helped it to recognise the wide benefits of improved numeracy skills, such as increasing employability and improving social cohesion. This had resulted in a successful drive to increase its numeracy provision for adults from 859 in 2006–07 to 1,117 in 2009–10.
64. Inspectors frequently found examples of successful local learning partnerships that had worked very effectively to coordinate provision for numeracy (and literacy) within a local geographical area. For example, where the providers planned numeracy programmes within local partnerships, they created and promoted clear progression routes and avoided duplicating resources by offering different numeracy programmes in the same areas.
65. More specifically, inspectors saw examples of how direct liaison with specialist organisations had enabled providers to work with specific groups of learners to support their development in numeracy. The successful initiatives in establishing discrete numeracy courses observed during the survey included:
- numeracy courses specifically for young mothers or young women at risk of pregnancy
 - using a wide range of local community venues for numeracy courses, especially in areas of deprivation
 - bespoke numeracy programmes in specialist organisations such as a women's refuge, mental health day centres, rehabilitation hostels for people seeking help to overcome misuse of drugs or alcohol
 - short programmes such as 'cooking on a budget', 'family finance', 'maths for fathers' and 'money matters – numeracy for managing finances'.
66. Family learning proved to be a successful route into discrete numeracy provision, often as progression from generic short family learning programmes or family literacy. Inspectors noted that a popular progression route from family numeracy was to teaching assistant courses.
67. Returning to learning in numeracy after a long gap can be daunting for anyone. Where the previous experience of learning has not been particularly successful, the barriers can seem overwhelming. Many of the learners that inspectors met said 'a step back' into the numeracy classroom had taken determination and even courage. The most common reasons for selecting a particular discrete numeracy class were:
- classes took place in a friendly community that learners were familiar with and were near their homes or had good public transport links
 - classes ran within the school day or after the learners' working day

- classes were free
 - arrangements for childcare were available
 - learners could attend with friends or neighbours
 - learners had already had a chance to meet the numeracy tutors and find out exactly what the class would be like
 - learners felt that the tutor would help them build on the numeracy they could remember and that they would not have to start all over again
 - learners in prisons identified how improved numeracy would help them find employment on release.
68. Attracting new learners to discrete numeracy provision for adults is critical in meeting the challenge of increasing the levels of numeracy nationally. However, inspectors found much of the paper-based marketing materials they reviewed to be inappropriate. They typically demanded high reading skills. They were cluttered, the print was generally too small and the text was full of jargon. While the materials generally stated the names and levels of qualifications, this information was given without explanation. More importantly, they did not promote what the numeracy courses involved well enough, or help to allay any fears that potential learners may have had by explaining that the courses had small classes and that learning was planned individually.
69. Learners who had, as they put it, 'crossed the threshold back to the numeracy classroom' were highly effective advocates for this provision. This was especially so in the six prisons visited, where the need for numeracy was particularly high, with between 42% and 71% of the prison populations assessed at below level 1. However, even with the deployment of peer mentors to promote the provision in prisons, take-up was low in five of the six prisons visited.
70. On the three visits to Probation Trusts for this survey, the initial assessment tools that offender managers used relied too much on each offender's self-assessment of his or her levels of numeracy and were not sufficiently thorough to identify all their needs. Referrals for a more detailed assessment and take-up of discrete numeracy provision varied considerably and often depended on:
- where numeracy fitted in the priority of interventions agreed between the offenders' manager and the offender
 - whether take-up of (literacy or) numeracy provision was required by a court order
 - the risk assessment of the offender.
71. The three Trusts had arranged for provision in numeracy on probation premises or for offenders to attend discrete provision at local specialist providers. The offenders received good specialist teaching and training, and tutors used the results of assessments well to plan relevant individual learning goals. However,

although offenders required to carry out unpaid work frequently developed general employability skills, including numeracy, their achievements were not recorded well enough and these offenders did not have opportunities to work towards qualifications in numeracy. The three Probation Trusts visited found it difficult in some instances to secure places for these learners in local provision.

Meeting employers' needs

72. The UK Commission for Employment and Skills has identified that a lack of employability skills, particularly numeracy, and lack of motivation, were key barriers for long-term unemployed people finding work and increased the risk that someone would leave work.¹⁸ However, inspectors found few examples of successful partnerships with employers that led to effective numeracy provision.
73. Train to Gain is an initiative introduced by the former government to promote skills development for those in employment and includes opportunities to gain vocational qualifications and qualifications in literacy and numeracy. However, national data indicate that take-up of basic skills provision has been low in comparison with the vocational programmes. Of the providers visited for this survey, 35 had Train to Gain contracts. Twenty-three of these providers had numeracy programmes in 2008–09, and nine of these programmes had fewer than 20 learners that year.¹⁹
74. In two of the providers visited, trade union advisers had played a key role in persuading employees to sign up for the Train to Gain programmes in numeracy, especially in large companies. Other successful initiatives that inspectors identified where providers had involved employers to support the development of their employees' numeracy skills included:
 - 'shadowing' employees at work to identify practical numeracy skills required for specific job roles, such as care workers in residential homes, that can be covered in future training programmes
 - setting up short skills-specific numeracy programmes, such as handling data in warehousing and distribution, at times and days to fit with the employees' shift patterns
 - talking to staff and employees to identify the generic employability skills that involve numeracy, such as reading printouts of 'clocking on' systems, accurate time-keeping for breaks or using 'company credit cards' in the staff canteen.

¹⁸ *Employability: incentivising improvement*, UKCES, 2010; www.ukces.org.uk/reports/employability-incentivising-improvement.

¹⁹ This reflects the findings from Ofsted's report on Train to Gain: *The impact of Train to Gain on skills for employment: a review to follow up the 2007/08 survey* (090033), Ofsted, 2009; www.ofsted.gov.uk/publications/090033.

75. The staff interviewed identified that much of the above work also helped them increase the work-related numeracy skills of their unemployed learners.

A good provider of vocational and discrete numeracy provision:

- assesses all learners, including part-time learners, at the start of their programme to provide them with feedback on their levels of numeracy in relation to their learning programme, career aims and/or employment
- ensures that learners are working towards qualifications that are at a level that builds on their prior attainment and are most suitable for their career aims and/or personal goals
- ensures that all learners on vocational programmes, up to and including level 2, take part in numeracy provision to develop the skills they need for their training and employment
- promotes numeracy provision successfully to potential learners, including those who may be reluctant to return to tackling previous problems in developing numeracy skills
- works well with employers to plan and promote discrete and vocational numeracy provision based at providers and in the workplace.

Tutor workforce

76. Meeting the development needs of learners returning to numeracy provision, often after negative experiences in the past, requires a good knowledge of mathematics and a good repertoire of teaching strategies and approaches. Despite various workforce reforms over the last decade, only 15 of the 46 providers where inspectors examined staff records had sufficient specialist numeracy tutors with a qualification in teaching numeracy at level 5, or equivalent. Of the 506 specialist numeracy tutors working in these providers 396 had the required generic teaching qualification. However, only 141 of them met the national requirements for tutor qualification in teaching numeracy.²⁰
77. Managers interviewed at all types of providers typically reported difficulties in recruiting qualified specialist numeracy tutors and in finding local training courses which led to the specialist qualifications.
78. Across the settings, the three most common areas for improvement that inspectors identified during the visits were:

²⁰ A survey conducted by the National Research and Development Centre for Adult Literacy and Numeracy on behalf of Lifelong Learning UK estimated that in 2007/08, 43% of adult numeracy teachers had a generic teaching qualification and a specialist numeracy teaching qualification in numeracy. *Teachers of adult literacy, numeracy and ESOL: progress towards a qualified workforce*, NRDC, 2010; www.nrdc.org.uk/publications_details.asp?ID=177.

- to increase tutors' expertise in understanding and assessing mathematical concepts and relate them to vocational and real-life situations
 - to share good practice in teaching numeracy across departments and local networks of partners
 - to provide subject-specific training in teaching numeracy and increase the number of tutors with specialist qualifications.
79. In around two thirds of the providers visited, inspectors identified a need for continuing professional development to improve the expertise of specialist numeracy tutors and vocational tutors teaching numeracy in at least one type of their provision or vocational area. Staff generally shared good practice and resources well within their teaching teams and most of the providers visited had put on full- or half-day numeracy sessions for all staff in the past two years or so. The impact of these measures often depended on how well the practice and resources shared were monitored to check that they were indeed good and being used. It also depended on whether managers monitored attendance at training events to ensure that the most appropriate members of staff benefited. The managers surveyed too often failed to examine the impact of staff development events on improving the quality of provision.
80. Evidence of better practice in developing the expertise of staff included:
- sharing good practice across departments or institutions, so that for example mathematics and numeracy specialists worked together, or tutors working in vocational areas, in discrete provision or in prisons shared their ideas and expertise
 - working with external consultants on national government-funded projects, such as the Skills for Life Improvement Programme (now the Skills for Life Support Programme)²¹
 - using subcontractors that specialise in numeracy to support learners and develop the expertise of vocational tutors.
81. In the case study below, an independent learning provider of apprenticeships had devised very thorough and effective systems for staff training and development.

Good practice: developing the expertise of vocational assessors

All the training and assessment is carried out at the learners' workplace. Vocational learning advisers are responsible for delivering key skills, as well as the NVQ. The provider has recognised that it is not practical to have specialist numeracy tutors and vocational assessors visit all learners at work. It therefore requires that all new learning advisers:

²¹ Skills for Life Support Programme; <http://sflip.excellencegateway.org.uk/>.

- attend a one-day numeracy session during their induction period, in which they complete a diagnostic assessment
- identify how they will deliver a learning session for the aspects of numeracy in which they have a low score, for example ratio, fractions
- work with the specialist numeracy skills trainer to develop their own skills and find appropriate training resources for their learners
- take the Application of Number qualification at level 2 as soon as possible after they start working for the provider
- use team meetings and the provider's virtual learning environment to share good practice and develop their own expertise in teaching work-related numeracy.

What makes it good practice?

The learning assessors have the additional specialist support and training they need to provide them with the skills, confidence and materials to teach learners numeracy to the required standard. Through completing the Application of Number qualification themselves, they develop a greater understanding of the requirements of the qualification to help their learners.

This provider's success rates for apprenticeships, including the Application of Number qualification are consistently good.

82. At the time of the survey visits, functional skills were being introduced and are scheduled to replace key skills qualifications. Providers have the option to delay implementation on some programmes, such as apprenticeships, until 2012. Nearly all the providers visited that were involved in vocational training had prioritised functional skills as a key area for staff development.
83. It was too soon to identify the impact of many of these initiatives. Ofsted's recently published survey report on the Diploma programme in its second year of operation found that the quality of functional skills teaching was variable.²² The separation of the teaching of functional skills from the 'principal learning', the main subject content of the diplomas, was an important weakness as the functional skills taught were not related to a vocational context. Many of the managers and tutors interviewed for the numeracy survey were aware of the challenge that they faced in implementing a qualification that assesses learners' ability to apply numeracy in meaningful contexts. As evidenced from this survey, learners benefit from developing their numeracy skills in real activities set in contexts that are relevant to their individual circumstances and/or employment.

²² *Diplomas: the second year – an evaluation of the strengths and weaknesses of the diplomas for 14–19-year-olds* (090240), Ofsted, 2010; www.ofsted.gov.uk/publications/090240.

Self-assessment and quality improvement

84. All but 10 of the 59 providers visited had a published strategy or policy for Skills for Life. However, very few of these documents made a sufficiently clear distinction between the strategic priorities for their numeracy provision as opposed to their literacy and language provision. Where the implementation of strategies was successful, it was supported by strong commitment from senior management.
85. Self-assessment and action-planning for improvement were generally insufficiently rigorous, especially where the provision was embedded in vocational programmes. The weaker aspects in self-assessment included insufficient exploration of the data to identify exactly where the provision was underperforming and little on the development of numeracy skills in the sections on vocational provision. In 25 of 59 visits, inspectors identified that providers were weak in the use of data to understand the extent of the need for numeracy provision within their institution or local area and how well their provision was meeting that need.
86. For example, in the weaker colleges managers did not know what the institutional trends were in the levels of numeracy of each year's intake of learners; and they were not able to measure the effectiveness of any strategy they had developed to ensure that more learners were accessing provision to improve their numeracy skills. Similarly, in the prisons surveyed, senior managers collected data each year on learners' levels of numeracy when they entered the prison, but were not aware of how many prisoners with low levels of numeracy chose to take up the provision or how many continued to avoid facing up to possible gaps in their skills.
87. Although all the providers visited collected achievement data for numeracy according to learners' age, gender and ethnicity, as required by the funding bodies, discussions with managers showed that analysis and use of success rates, by ethnic group and gender, to improve outcomes for all learners varied considerably. Only five colleges, four local authorities and three independent learning providers demonstrated that they had used this data very effectively to identify which learners were doing especially well in numeracy and which were not. These providers produced good examples of action taken to increase the outcomes for specific groups.
- One college had conducted a close analysis of learners' outcomes on discrete numeracy provision for learners aged 16 to 18 and had taken swift and appropriate action to increase achievement by learners from underperforming minority ethnic groups. This included providing additional support for these learners during part of the sessions so that they could each focus on the specific skills identified for further development
 - Three providers of adult and community learning gave additional language support in numeracy provision to increase the outcomes for learners who spoke English as an additional language

- One independent learning provider highlighted to training staff the relatively poorer performance in Application of Number by White British men on apprenticeships; pass rates showed that this gap in achievement had been narrowed in 2009–10.
- 88. Success rates nationally indicate that too many learners are failing to complete their programmes, but the quality improvement plans reviewed in the providers visited rarely had detailed action for increasing retention. The providers recorded learners' progression through the different levels of the numeracy courses that they offered, but were unable to provide inspectors with comprehensive information on learners' destinations regarding further training or employment on leaving the provider. They were therefore unable to gather sufficient evidence to evaluate the impact of the numeracy provision on increasing learners' life chances and employability.
- 89. The weaker quality improvement plans reviewed did not readily make the link between low success rates and lack of expertise in teaching the technical aspects of numeracy. Reviews of the records of observation of teaching and learning at the weaker providers showed that tutors did not receive specific, sufficiently detailed feedback on the quality of their teaching in numeracy.

A good provider of numeracy:

- uses data well to monitor the impact of its numeracy provision on meeting the numeracy needs within its institution and where relevant, in the local community
- ensures that all staff teaching numeracy have appropriate expertise and qualifications in teaching or supporting numeracy
- ensures that staff who teach numeracy receive sufficiently detailed feedback on their skills in teaching the technical aspects of numeracy
- has thorough procedures for identifying and sharing good practice in teaching numeracy across types of programmes and subject areas.

Notes

National data on participation and achievement in post-16 numeracy, research and inspection findings were evaluated to identify the extent of the challenge in meeting the numeracy needs of young people and adults. Inspectors then visited 59 providers to identify good and weaker practice and to suggest ways in which the latter could be improved.

The sample consisted of 20 colleges that provided vocational training to 16–18-year-olds, discrete adult numeracy and where contracted to do so, apprenticeships and part-time vocational programmes; 16 local authorities that provided adult and community learning and/or part-time vocational programmes, apprenticeships and Train to Gain; three adult and community learning providers; 14 independent learning providers or employers providing apprenticeships and/or Train to Gain; six prisons; and three Probation Trusts. They were located in inner cities, provincial towns and rural areas.

Of those providers visited for the survey, five were judged outstanding, 19 were good and 32 were satisfactory for overall effectiveness at their last institutional inspection. No providers currently judged inadequate for overall effectiveness were visited as part of this survey. The prisons in the sample were selected according to category: one each of category A/B local; B local; C Training; D Open; and Resettlement. In addition, inspectors visited a women's prison. The training prison was a privately run prison that catered for both men and women.

During the visits, inspectors explored four aspects of provision: identifying and meeting needs; curriculum management and quality assurance; classroom practice; and outcomes for learners. In all the providers visited, inspectors observed teaching and learning sessions and scrutinised documentation relating to the curriculum for numeracy, the management of the provision and the standards achieved by learners. During the visits to each provider, inspectors held discussions with learners, staff and employers, and where relevant, with learners who had been identified as requiring numeracy support, but had declined to take up the provision.

Further information

Publications by Ofsted

Mathematics: understanding the score (070063), Ofsted, 2008;
www.ofsted.gov.uk/publications/070063.

Removing the barriers to literacy (090237), Ofsted, 2011;
www.ofsted.gov.uk/publications/090237.

Other publications

Adult numeracy – a review of research, National Research and Development Centre for Adult Literacy and Numeracy, 2010;
www.nrdc.org.uk/uploads/documents/doc_2802.pdf.

Employability: incentivising improvement, UK Commission for Employment and Skills, 2010; www.ukces.org.uk/reports/employability-incentivising-improvement.

Making it all add up – business priorities for numeracy and maths. Confederation of British Industry, 2010;
[www.cbi.org.uk/ndbs/positiondoc.nsf/1f08ec61711f29768025672a0055f7a8/7B754FFBFF7969E58025778B0053AF26/\\$file/20100801-making-it-all-add-up.pdf](http://www.cbi.org.uk/ndbs/positiondoc.nsf/1f08ec61711f29768025672a0055f7a8/7B754FFBFF7969E58025778B0053AF26/$file/20100801-making-it-all-add-up.pdf).

Numeracy counts – NIACE Committee of Inquiry on Adult Numeracy Learning, National Institute of Adult Continuing Education, 2011;
<http://shop.niace.org.uk/numeracy-counts.html>.

Review of vocational education – The Wolf Report, Department for Education and Skills, 2011;
www.education.gov.uk/publications/standard/publicationDetail/Page1/DFE-00031-2011

Skills for jobs: today and tomorrow – the National Strategic Skills Audit for England 2010, UK Commission for Employment and Skills, 2010;
www.ukces.org.uk/reports/skills-for-jobs-today-and-tomorrow-the-national-strategic-skills-audit-for-england-2010-volume-1-key-findings.

The skills for life survey: a national needs and impact survey of literacy, numeracy and ICT skills (RR 490), Department for Education and Skills, 2003;
www.education.gov.uk/rsgateway/DB/RRP/u013476/index.shtml.

Websites

The Learning and Skills Improvement Service;
www.lsis.org.uk.

The National Centre of Excellence in the Teaching of Mathematics
www.ncetm.org.uk.

The National Institute of Adult Continuing Education
www.niace.org.uk.

The National Research and Development Centre for Adult Literacy and Numeracy
www.nrdc.org.uk.

Annex A: Providers visited for this survey

Colleges	Location
Bexley College	Bexley
Bradford College	Bradford
Brooklands College	Surrey
Calderdale College	Calderdale
City of Westminster College	London
City of Wolverhampton College	Wolverhampton
Croydon College	Croydon
Kirklees College	Kirklees
Lancaster and Morecambe College	Lancashire
Loughborough College	Leicestershire
New College Durham	Durham
New College Nottingham	Nottingham
North Nottinghamshire College	Nottinghamshire
Sparsholt College Hampshire	Hampshire
Swindon College	Swindon
The Isle of Wight College	Isle of Wight
Tower Hamlets College	London
West Kent College	Kent
Wiltshire College	Wiltshire
Worcester College of Technology	Worcestershire

Local authorities	Location
Birmingham City Council	Birmingham
Borough of Poole	Poole
Derbyshire County Council	Derbyshire
Essex County Council	Essex
Gloucester City Council	Gloucestershire
Luton Borough Council	Luton
Milton Keynes Council	Milton Keynes
North Yorkshire County Council	North Yorkshire
Nottingham City Council	Nottingham
Oldham Metropolitan Borough Council	Oldham
Oxfordshire County Council	Oxfordshire

Peterborough City Council	Peterborough
Walsall Metropolitan Borough Council	Walsall

Independent learning providers and employers	Location
---	-----------------

Apprenticeship Training Ltd	Southampton
Aurelia Training Limited	Warwickshire
Babcock Training Limited	Bristol
Care Learning Centre	Isle of Wight
Catch22 Charity Limited	Portsmouth
East of England Co-operative Society Limited	Suffolk
Education & Youth Services Limited	Hertfordshire
Exchange Group	Chiswick
Happy Child Limited	London Borough of Ealing
Hospitality Training Partnership (IOW) Limited	Isle of Wight
Lifetime Health & Fitness Limited	Bristol
Ministry of Defence (RAF)	Gloucestershire
Prostart	Nottingham
Straight A Training	Hampshire

Other organisations	Location
----------------------------	-----------------

Blackfriars Settlement	London Borough of Southwark
Greater Manchester Probation Trust	Manchester
HMP & YOI Styal	Cheshire East
HMP Belmarsh	London Borough of Greenwich
HMP Featherstone	Wolverhampton
HMP Latchmere House	Surrey
HMP Peterborough	Peterborough
HMYOI & Remand Centre Feltham	London Borough of Harrow
Morley College	London Borough of Lambeth
Myrrh Limited	London Borough of Southwark
Norfolk and Suffolk Probation Trust	Norfolk
Thames Valley Probation	Oxfordshire

Annex B: Numeracy levels

The descriptions of skills and examples in this table are from *Adult numeracy – a review of research and related literature*, National Research and Development Centre for Adult Literacy and Numeracy, 2010; www.nrdc.org.uk/uploads/documents/doc_2802.pdf.

Level	Skills	Example
Entry level 1	Understands information given by numbers and symbols in simple graphical, numerical and written material.	recognising and selecting coins, or ordering and comparing numbers up to 10
Entry level 2	Understands information given by numbers, symbols, simple diagrams and charts in graphical, numerical and written material	calculating costs and change, or adding and subtracting two-digit whole numbers
Entry level 3	Understands information given by numbers, symbols, diagrams and charts for different purposes and in different ways in graphical, numerical and written material	dividing two digits by one digit and interpreting remainders, or comparing weights using standard units
Level 1	Understands straightforward mathematical information used for different purposes and can independently select relevant information from given graphical, numerical and written material	doing simple percentages, or converting units of measure
Level 2 and above	Understands mathematical information used for different purposes and can independently select and compare relevant information from a variety of graphical, numerical and written material	calculating ratios and proportions, or determining median, mean and mode.