

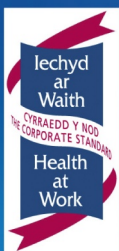


Rhagoriaeth i bawb – Excellence for all

Arolygiaeth Ei Mawrhydi dros Addysg
a Hyfforddiant yng Nghymru

Her Majesty's Inspectorate
for Education and Training in Wales

Improving numeracy in key stage 2 and key stage 3



APRIL 2010

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- ▲ secondary schools;
- ▲ special schools;
- ▲ pupil referral units;
- ▲ independent schools;
- ▲ further education;
- ▲ adult community learning;
- ▲ youth support services;
- ▲ youth and community work training;
- ▲ Local authority education services for children and young people;
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Introduction

- 1 This report is published in response to a request in the Welsh Assembly Government's annual remit to Estyn for 2009-2010. The report provides an overview of standards and the quality of provision in numeracy in key stage 2 and key stage 3. The report builds on the Estyn survey report published in June 2009, 'Best practice in mathematics for pupils aged 3 to 7 years'.¹
- 2 The purpose of the report is to evaluate the effectiveness of initiatives to improve standards of numeracy and to identify examples of best practice in key areas. These areas include basic skills numeracy support programmes, the use of numeracy in subjects across the curriculum and the effectiveness of provision for pupils' movement from key stage 2 to key stage 3.
- 3 Appendix 1 of this report contains case studies of good practice which are organised in the same structure as this report.
- 4 The report is intended mainly for staff involved in teaching mathematics and numeracy, for school leaders and managers, and for local authority advisers. The report may also be useful to others with an interest in education. Schools and local authorities may wish to use Appendix 2 to review and improve practice in improving numeracy.
- 5 The findings and recommendations in this report draw on:
 - inspection outcomes of primary and secondary schools between 2005 and 2009;
 - national curriculum teacher assessments in mathematics at key stage 2 and key stage 3;
 - interviews with staff in 11 primary and 10 secondary schools;
 - observation of numeracy 'catch-up'² groups in these schools and discussion with pupils;
 - questionnaires completed by officers in 21 local authorities and interviews with advisory staff in seven local authorities; and
 - documentation provided by schools and local authorities.

¹ http://estyn.co.uk/ThematicReports/best_practice_in_mathematics_for_pupils_aged_3_to_7_years_june_2009.pdf

² Catch up groups are intended to help those pupils not on the special needs register to fill gaps in their knowledge and to then be able to access the work of their peers in numeracy.

Background

- 6 Numeracy is not the same as mathematics. Numeracy is a proficiency with number that is acquired through being taught mathematics well. Although pupils usually learn their numeracy skills during mathematics lessons, to be fully numerate they must be able to apply these skills in other subject areas and real-life contexts.
- 7 Numerate individuals are able to function responsibly in everyday life and contribute effectively to society. Numerate pupils are able to:
- handle numbers fluently in mental, oral and written work;
 - exploit patterns within number when calculating and approximating;
 - measure and calculate accurately and estimate reasonably, using appropriate units of time, length, area, volume, mass, capacity, angle and related compound measures;
 - use calculators accurately and appropriately;
 - use an increasing range of skills to identify, analyse and describe practical problems or tasks involving numerical data;
 - read, extract, interpret and analyse numerical and statistical data from a range of sources and presented in a variety of forms; and
 - select appropriate techniques to represent data.
- 8 Research suggests that difficulties with numeracy can restrict opportunities throughout an individual's life. A Basic Skills Cymru survey of adults in Wales aged 16 to 64-years-old, found that 53% have numeracy skills below the level expected of an 11-year-old³. This group have difficulties with day-to-day handling of numbers involving percentages and fractions, and problems with the calculations involved in their jobs. One third of this group has very low skills, and is unable to cope with even the simplest of calculations. Adults with weak numeracy skills struggle to manage home finances as well as cope with aspects of their work.
- 9 Further education colleges, higher education institutions and employers continue to express concerns at the low levels of numeracy of school leavers.
- 10 In 2008, the Welsh Assembly Government Department for Children, Education, Lifelong Learning and Skills published the Skills Framework for 3 to 19-year-olds in Wales. The framework provides guidance on how to develop continuity and progression across the curriculum and between key stages in the skills of thinking, communication, information and communication technology (ICT) and number. The section for developing number aims to help teachers improve pupils' numeracy skills across all subject areas.

³ Adult literacy and numeracy survey, Basic Skills agency 2004

- 11 Basic Skills Cymru Strategic Intervention Grants offer funding to local authorities to help improve basic skills, including numeracy. This funding has been used, among other things, on intervention programmes, often referred to as 'catch-up', for children who are falling behind their peers. Many schools and local authorities also use Better Schools Fund grants and RAISE⁴ grants to support literacy catch-up initiatives. The majority now offer a similar level of support for numeracy.
- 12 There is a range of evidence highlighting problems with standards of numeracy in primary schools and secondary schools. The most relevant evidence is in:
- *Raising Standards of Numeracy in Primary Schools: A Framework for Action in Wales*, Welsh Office/OHMCI, 1999;
 - *Aiming for Excellence in Key Stage 3* (Estyn 2002; reissued, 2004);
 - *Words Talk - Numbers Count* ((Welsh Assembly Government, 2005);
 - *Review of the contribution of the Aiming for Excellence Programme to the raising of standards in Key Stage 3*, (Estyn, November 2006);
 - *Moving On ... Effective Transition from Key Stage 2 to Key Stage 3* (Estyn/Welsh Assembly Government/ACCAC, 2004);
 - *Moving On...Improving Learning*, (Estyn/Welsh Assembly Government/ACCAC, 2004);
 - *Bridging the Gap - Developing and using bridging units to support effective transition from Key Stage 2 to Key Stage 3* (ACCAC/Welsh Assembly Government/Estyn, 2004);
 - *The bilingual video package Raising Standards in Literacy and Numeracy in Key Stage 3* (BBC Wales/Estyn/Welsh Assembly Government/ACCAC, 2002);
 - *Best practice in mathematics for pupils aged 3 to 7 years*, (Estyn, 2009);
 - *How to review basic skills learning and teaching provision, a guide for senior managers* (Basic Skills, Cymru Welsh Assembly Government 2009);
 - *The impact of transition plans* (Estyn, June 2008).

⁴ Raise Attainment and Individual Standards in Education' programme. Over the three-year period from 2006-2007 to 2008-2009, the Welsh Assembly Government provided an annual grant of £16.25m, of which around £14.5m has gone directly to schools. The grant was directed to schools with 20% or more pupils entitled to free school meals as long as they had 50 or more pupils of statutory school age.

Main findings

Standards in mathematics in National Curriculum teacher assessments

- 13 Since 2005 there has been very little improvement in the standards of attainment in mathematics in key stage 2 and key stage 3. In 2009, a higher proportion of pupils in key stage 2 continue to gain the expected level in mathematics than in key stage 3. The gap in performance between the two key stages has increased since 2007.
- 14 More pupils achieve above the expected level in mathematics in key stage 3 than in key stage 2. However, the percentages of pupils gaining these higher levels have declined since 2005 in both key stages. Overall, girls continue to outperform boys although the gap in performance is relatively small and more-able boys perform well.

Standards in mathematics and numeracy in inspections

- 15 Standards of numeracy are stronger in key stage 2 than in key stage 3 in school inspections since September 2005. Standards of achievement in the mathematics lessons observed during inspections are also better in key stage 2 than in key stage 3. Many of the shortcomings in pupils' standards in mathematics lessons in both key stages are related to the inadequate recall of basic number facts and a lack of effective strategies for mental or written calculations.

Numeracy intervention programmes

- 16 The majority of schools organise numeracy catch-up programmes and in many of these pupils' skills improve. In the most effective programmes, nearly all pupils make more progress than expected and many of these pupils go on to gain the expected National Curriculum levels at the end of the key stage. However, schools and local authorities do not monitor the effectiveness of these programmes enough.
- 17 Schools with the most effective intervention programmes make sure that tutors work closely with class teachers, choose carefully the pupils who need support, track their progress efficiently and involve parents well.

Numeracy as a skill across the curriculum

- 18 Where standards of numeracy are good in primary schools, pupils apply their numeracy skills well in a range of subjects across the curriculum and in real life contexts.
- 19 However, only a few secondary schools have well co-ordinated strategies to develop pupils' numeracy skills across the curriculum. Many schools do not make enough use of opportunities to develop pupils' numeracy skills during the study of other subjects. In a minority of lessons, teachers of subjects across the curriculum have too low expectations of pupils' numeracy skills and they allow pupils to use calculators for basic calculations that the pupils should do mentally.

- 20 Many secondary schools have appointed a co-ordinator who has begun to identify the numeracy demands of other subjects. A few schools have adapted their schemes of work to make sure pupils are prepared for the numeracy demands of different subject areas. However, in general, schools have not yet developed this initiative sufficiently to have enough impact on improving the standards of pupils' numeracy skills.

Transition between key stage 2 and key stage 3

- 21 Planning for transition between secondary schools and their partner primary schools has improved over recent years. Many primary schools send specific information on pupils' prior attainment in mathematics, but only a very few transfer the same quality of information on numeracy. Many teachers in key stage 3 do not place enough emphasis on teaching effective strategies for mental and written calculation to make sure that pupils' numeracy skills continue to improve.
- 22 The majority of clusters of secondary schools and their partner primary schools organise joint activities designed to improve progression in mathematics from key stage 2 to key stage 3. However, in general, these activities do not focus enough on numeracy. Many secondary schools do not evaluate rigorously enough the impact of transition initiatives in raising standards of numeracy in Year 7.

Leadership and management in schools

- 23 In the majority of primary and secondary schools visited, the expertise, leadership and commitment of subject leaders contributed significantly to the success of initiatives to improve numeracy. Teachers in the schools with the most effective strategies for improving numeracy benefit from national and local training.
- 24 Many schools monitor effectively the quality of pupils' work in mathematics, but very few schools monitor the standards of numeracy skills in other subject areas. Most schools do not evaluate the impact of different numeracy initiatives, such as catch-up, rigorously enough and the majority do not evaluate the contribution of these initiatives to improving end-of-key-stage attainment.

The work of local authorities

- 25 Overall, local authority numeracy advisers provide good support and resources to help schools improve pupils' numeracy skills in key stage 2. However, there is inconsistent specialist support for numeracy in key stage 3.
- 26 Many local authorities provide training to support numeracy catch-up programmes. Most schools rate this training as very good or excellent and consider that it significantly improves the quality of the programmes. However, a minority of local authorities do not monitor the effectiveness of this training well enough to know whether these schools are offering programmes or how many pupils benefit from them.

Recommendations

Schools should continue to raise standards in numeracy by:

- R1 exploiting opportunities for pupils to apply their numeracy skills in the context of subjects other than mathematics and in real life contexts;
- R2 planning carefully to make sure that pupils have learned the necessary skills in mathematics before they need them elsewhere;
- R3 supporting pupils who make the least progress with effective intervention programmes and tracking their progress to the end of the key stage;
- R4 making sure that more-able pupils gain the higher levels in National Curriculum assessments;
- R5 giving more attention to improving pupils' skills in mental and written calculations;
- R6 agreeing and implementing clear policies for the appropriate use of calculators;
- R7 making better use of information about pupils' achievements in numeracy when they transfer to the secondary phase, particularly for those pupils on intervention programmes;
- R8 making sure that those delivering numeracy initiatives and intervention programmes have enough training and resources; and
- R9 making sure that senior managers play a key role in improving numeracy in the school.

Local authorities should:

- R10 have a well-developed whole-authority numeracy strategy that identifies explicitly action to improve standards of numeracy at key stages 2 and 3, with a particular focus on improving pupils' mental and written calculation skills;
- R11 monitor numeracy intervention programmes in schools more thoroughly, particularly those that receive funding grants, to know whether they offer value for money; and
- R12 make sure that schools track more rigorously the progress made by pupils as a result of numeracy initiatives.

The Welsh Assembly Government should:

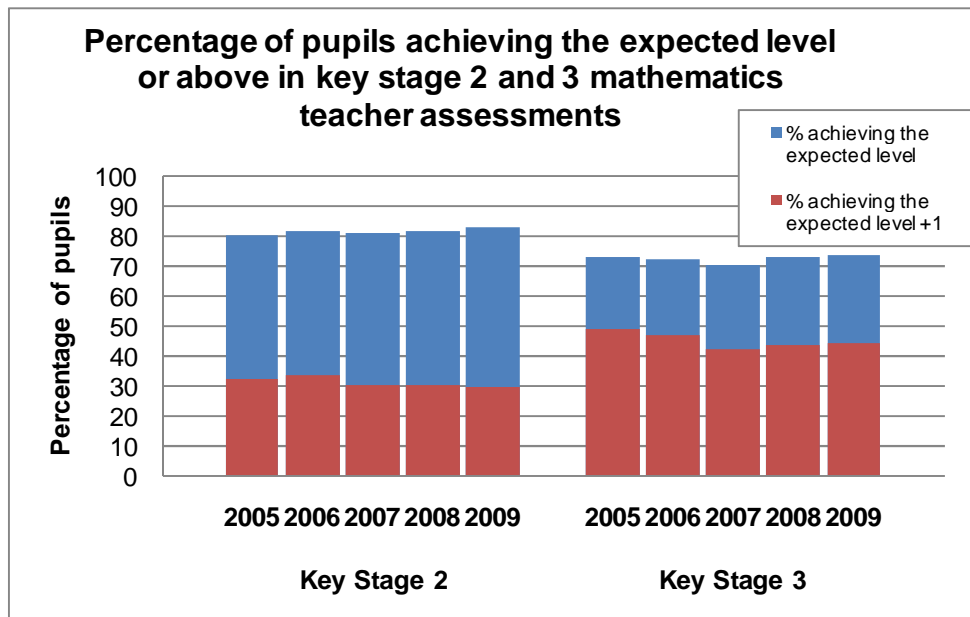
- R13 continue to make funding available in the Better Schools Fund and Basic Skills Strategic Intervention Grants for local authorities and schools to improve numeracy skills; and
- R14 impress on local authorities and schools the need to develop a strategic approach to planning, monitoring and evaluating targeted numeracy intervention programmes to make sure these are effectively delivered and tracked.

Standards in mathematics and numeracy in key stage 2 and key stage 3

- 27 Pupils' standards in mathematics are often higher than their achievement in numeracy across the curriculum because they do not apply the numeracy skills they have learned in mathematics well enough outside mathematics lessons.

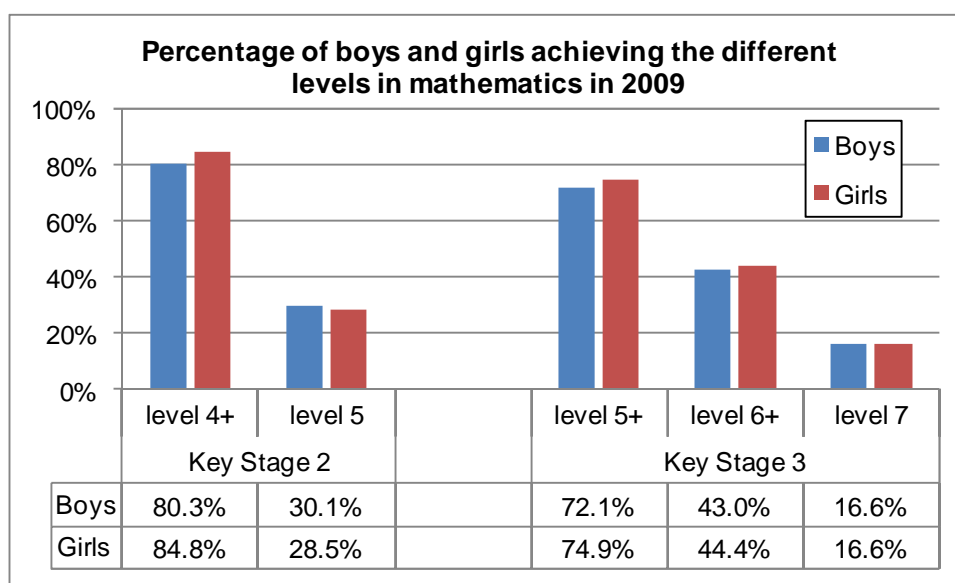
Standards in National Curriculum assessments in mathematics

- 28 Since 2005, there has been very little improvement in standards of attainment in mathematics in key stage 2 or key stage 3, as shown in the chart below:



- 29 Since 2005, the percentage of pupils attaining level 4 or above in mathematics at the end of key stage 2 has improved by nearly three percentage points. However, the percentage of these pupils attaining level 5 in mathematics has continued to decrease and is now three percentage points below the 2005 figure.
- 30 More pupils in key stage 2 gain level 4 and level 5 in mathematics than in English or Welsh first language. However, the percentage of pupils attaining these levels in mathematics is lower than in science.
- 31 At the end of key stage 3, the percentage of pupils achieving the expected level in mathematics declined between 2005 and 2007. Although this percentage improved in 2008 and 2009, it is only very slightly above the 2005 figure. The percentage achieving level 6 or above has also decreased and remains nearly four percentage points below the 2005 figure despite small improvements in since 2008.
- 32 In key stage 3 the most-able pupils achieve level 7 or above. The percentage of pupils reaching this level has remained at around 15% or 16% since 2005 with a very slight improvement in 2009. More pupils gain level 6 or level 7 in mathematics than in the other core subjects of English or Welsh first language and science. However, more pupils gain at least level 5 in science and Welsh first language than in mathematics.

- 33 A higher proportion of pupils in key stage 2 gain the expected level in mathematics than in key stage 3. This gap between the two key stages has increased since 2007. However, more pupils achieve level 6 and level 7 in key stage 3 than achieve level 5 in key stage 2.
- 34 The charts below show that in 2009 girls outperform boys, although the gap in performance is relatively small in both key stages. However, boys perform well on the higher levels. At key stage 2, boys achieve better than girls at level 5 and at key stage 3 the same percentage of boys and girls gain level 7. The gap between boys and girls attainment is smaller in mathematics than in the other core subjects in key stage 2 and in key stage 3.



Standards in mathematics and numeracy in inspections

- 35 Standards of achievement in the mathematics lessons observed during inspection are better in key stage 2 than in key stage 3. Generally, in key stage 2, more than three-quarters of mathematics lessons are good or better. In 2009, fewer key stage 2 lessons were judged to be good or better in mathematics than in the other core subjects. In key stage 3, the percentage of good or better lessons in mathematics varies between 50% and 70% since September 2005. In 2009, more key stage 3 lessons were judged to be good or better in mathematics than in English or science but fewer than in Welsh as a first language.
- 36 Many of the shortcomings in pupils' standards in mathematics are related to weaknesses in their numeracy skills. The most common of these, in both key stage 2 and key stage 3, include too many pupils who:
- have difficulty in recalling basic number facts, including multiplication facts, which slows their ability to perform basic calculations;
 - do not have effective strategies to help them calculate mentally;
 - are not confident in using an efficient written method for routine calculations;

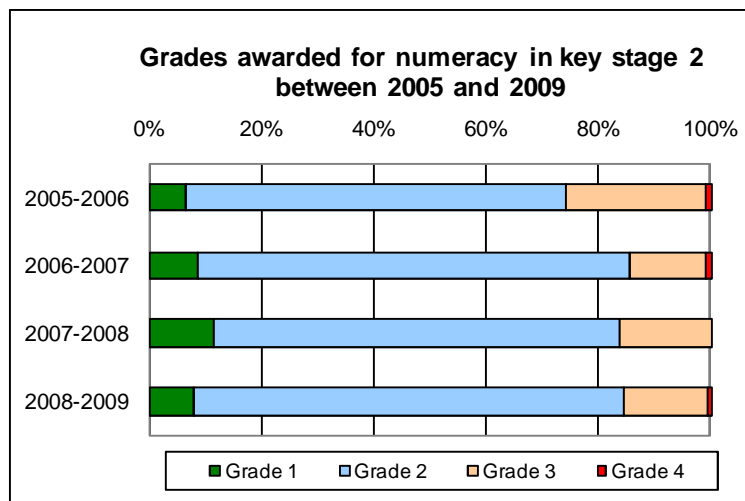
- do not fully understand place value; and
- have difficulty in working with fractions, decimals and percentages.

37 In addition, in key stage 3, too many pupils:

- cannot estimate the results of written or mental calculations or reflect on whether their answers are reasonable; and
- use calculators for simple calculations, where a mental or written method would be more appropriate.

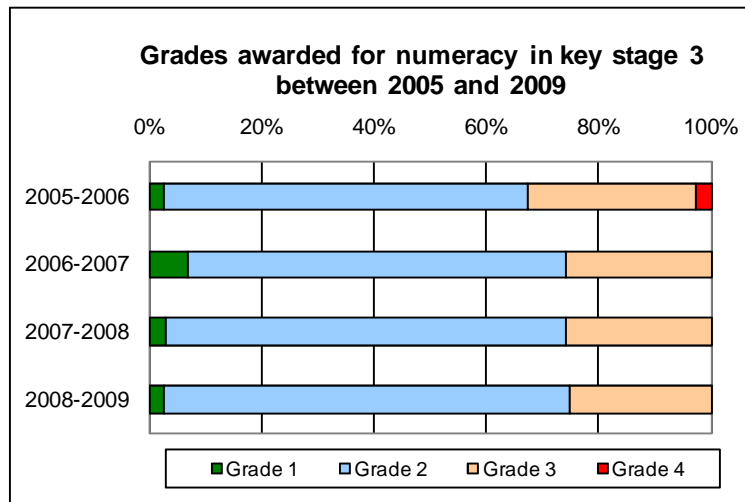
38 In both key stages, these shortcomings arise when teachers do not spend enough time developing pupils' basic number skills or providing enough practice and reinforcement to embed them. In addition, teachers do not give pupils enough opportunities to apply their numeracy skills.

39 During inspection, inspectors award a grade for pupils' standards of numeracy in subjects and areas of learning across the curriculum. The chart below shows the distribution of these grades in key stage 2 between 2005 and 2009:



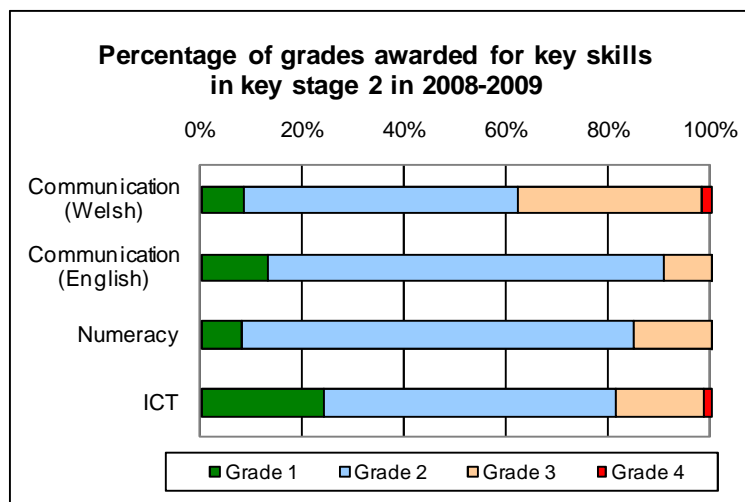
40 Since 2005 there has been an improvement in the standards of numeracy in key stage 2. The percentage of schools, where there are important shortcomings, has dropped from 26% in 2005 to 15% in 2009.

41 The chart below shows the distribution of numeracy grades for key stage 3 in the same period:



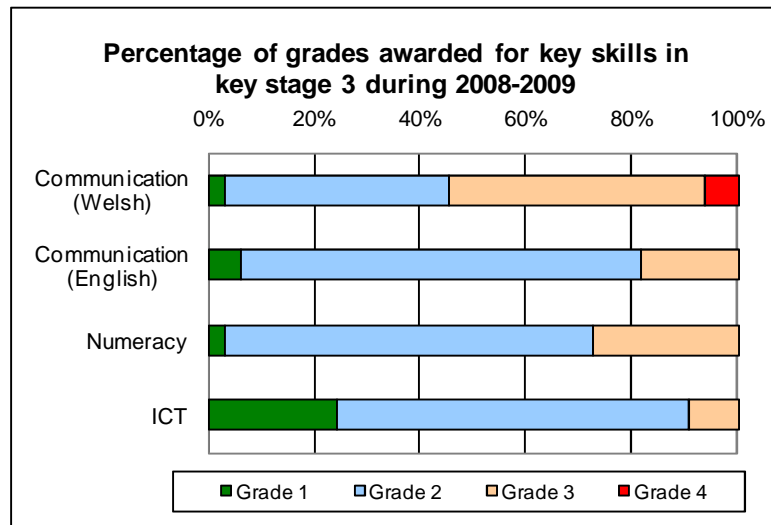
42 In key stage 3, there has not been the same improvement in standards of numeracy as in key stage 2. In 2009, there are important shortcomings in standards of numeracy in nearly 1 in 4 schools.

43 The chart below shows the grades awarded for communication skills, numeracy and ICT in key stage 2 during inspections in 2008-2009.



44 In key stage 2 in 2008-2009, standards in numeracy and in communication through English are similar with slightly more outstanding features identified in communication. There are more outstanding features identified in ICT but also more important shortcomings. Standards are lowest in communication through Welsh.

- 45 The chart below shows the grades awarded for communication skills, numeracy and ICT in key stage 3 during inspections in 2008-2009.



- 46 In key stage 3 in 2008-2009, standards are best in ICT and in communication through English. There are more important shortcomings in numeracy than in these two key skills. In key stage 3, again, standards are lowest in communication through Welsh.

Numeracy intervention programmes

- 47 Across Wales, the majority of primary schools and secondary schools offer catch-up programmes for numeracy. Schools use a range of different models of provision. The most common way to offer additional support is to withdraw a small group of pupils from mainstream lessons or other activities during the school day.
- 48 The effectiveness of both primary and secondary catch-up programmes, and the extent to which pupils continue to make progress after the intervention, varies too much between local authorities and between schools across Wales.

Selection of pupils

- 49 The schools with the most successful intervention programmes have clear and precise criteria for selecting pupils. Most of these schools target pupils who may not reach the expected level at the end of the key stage without extra support. Many use scores on standardised tests in mathematics as well as advice from the class teacher to identify these pupils. In the best practice, secondary schools also ask primary school teachers to identify those pupils who would benefit from support during Year 7. Schools where pupils show lower gains while on the catch-up programmes often identify pupils who are on the special educational needs register. Short intervention programmes are not suitable for these pupils, who need more intensive and sustained support in order to make progress.
- 50 The number of pupils in each school involved with these programmes varies. For example, a few secondary schools support up to 50 Year 7 pupils each year, whereas other schools support fewer than 10 pupils. Primary schools support as few as two or three pupils or as many as 60 pupils across all year groups, depending on the needs of pupils and the resources available.

Organisation

- 51 Schools usually organise intervention lessons once or twice a week for between 30 minutes to one hour. In primary schools many programmes run for between eight and 10 weeks, although in secondary schools they often last for the whole of the school year. The most effective groups cater for around four or five pupils at a time, in order to provide sufficient support for each pupil. Many secondary schools and the majority of primary schools have more than one catch-up group.
- 52 Secondary schools usually operate a system that avoids withdrawing pupils from the same lessons each week. Many primary schools withdraw pupils for support in the afternoons. In a few primary schools, pupils are withdrawn from their mathematics or language lessons in the morning. Pupils in these schools often fall even further behind in these subjects as a result.
- 53 A minority of secondary schools, particularly those where older pupils coach younger pupils, organise support groups during registration once or twice a week. However, in a few schools the registration period is too short and these sessions are often cancelled to allow for other activities. In these schools, pupils do not make as much progress as they could.

Use of classrooms

- 54 A minority of schools set aside a dedicated room for the catch up programmes, often shared with literacy. In most of these rooms, good-quality display reminds pupils of basic number and other mathematical facts and demonstrates images such as number lines, place value cards, multiplication squares and other apparatus designed to aid pupils' calculation skills. Having a specific room enables tutors to have all necessary resources to hand and gives the lessons the same status as other classes for pupils.
- 55 In the remaining majority of schools, lessons take place in any available space and tutors usually have a set of materials to carry around with them. However, in a few schools these rooms lack whiteboards or display space, which limits the effectiveness of the programmes.

Teaching assistants

- 56 The role undertaken by teaching assistants in improving pupils' numeracy has developed considerably in recent years. The majority of schools now use teaching assistants to provide extra numeracy support for those pupils who need it. Many schools and local authorities have trained teaching assistants to deliver this support. Pupils make the most progress on these programmes when the teaching assistants work closely with the class teachers and with mathematics subject leaders.

Teachers

- 57 In a minority of schools, a part-time teacher delivers the catch-up programme. In a very few schools, a class teacher is released to teach the intervention group. Many schools prefer not to use this model because of the need to cover the teacher's own class.
- 58 In addition, a few local authorities use the Strategic Intervention Grants to employ a teacher who moves between schools to teach the groups. This model is most successful when the local authority requires the school to match the support with a member of their own staff, who gradually takes over the group. However, if only the visiting teacher teaches the group, without any school staff present, this does not increase the expertise in the school and fewer pupils, therefore, benefit from support.

Numeracy 'buddies'

- 59 In an increasing number of secondary schools, older pupils act as 'buddies' or coaches to support identified pupils in key stage 3. The buddies are usually students from Years 12 and Year 13 although Year 10 and Year 11 pupils also fulfil this role well in a few 11-16 schools. Most of these schools provide appropriate training to help the buddies to fulfil their role well. In the majority of the schools, buddies are able to gain credit towards key skills qualifications in working with others, the community element of the Welsh Baccalaureate Qualification or the Duke of Edinburgh award as a result of supporting the younger pupils.

- 60 In most of these schools, pupils make good progress and enjoy the support of the buddies. A few schools track the progress the pupils make to the end of key stage 3 and report that many of them reach level 5 by the end of Year 9. However, too many schools do not monitor the work of the buddies closely enough.

Parents

- 61 Many schools contact parents before pupils are to be included in catch-up programmes in order to secure their support. A minority of schools provide family numeracy or awareness raising sessions for the parents of the pupils on these programmes. A few primary schools run workshops for the parents of pupils on catch-up programmes in which pupils demonstrate some of the activities and strategies they have learnt. The parent and child then make a game involving some of the strategies and take it home to use. These workshops are very useful to parents and improve their confidence to support their child. However, too many schools do not involve parents effectively enough for them to support these pupils well.

Resources

- 62 Most programmes concentrate on basic number facts, including multiplication facts, and mental and written methods of calculation. The most common materials used in key stage 2 are those from the national strategies in England and commercial materials which have been translated into Welsh. In key stage 3, many schools use the Number Workout materials from Basic Skills Cymru. In a very few local authorities, officers have produced very good quality materials tailored to address school or local priorities, or identified weaknesses. All these materials are used most successfully when they are supplemented with the school's or local authority's own resources and with materials and equipment.

Use of ICT packages

- 63 In a few local authorities, schools use a commercial ICT package for short periods between three and five times a week. These programmes are designed to identify the number skills that pupils need to develop, and provide help and practice on these skills. Most of the programmes provide comprehensive feedback on pupils' progress and their level of skills at the start and end of the support. The main software packages also provide an indication of the national curriculum level for that pupil. These programmes are most successful in schools where school or local authority staff provide extra resources to supplement the ICT package.

Use of numeracy booklets in form periods

- 64 In a minority of secondary schools, mathematics teachers provide numeracy practice booklets for all pupils to complete with their form tutors during registration. These are most successful when the numeracy co-ordinator supports form teachers well and trains them in the methods of calculation used by the mathematics department. In these schools, the booklets provide useful opportunities for pupils to reinforce and practise their skills. However, in many other schools, form tutors do not receive training and are not aware of the methods for calculation used within the

mathematics department. This causes even greater confusion for those pupils who need the most help. Most schools do not monitor and evaluate the effectiveness of this provision well enough.

Progress made by pupils

- 65 Nearly all pupils enjoy the activities in the catch-up sessions and feel more confident in their mathematics lessons as a result. Many pupils' calculation skills improve. A few pupils, in primary and secondary schools, move into a higher mathematics set after the support because their numeracy skills have improved.
- 66 Nearly all schools test pupils at the start and end of the programme to measure the progress made. In all the schools visited, many pupils on intervention programmes made progress during the programme, even on short eight-week programmes. In many of these schools nearly all pupils made significant gains and in a few schools all pupils made more progress than could be expected. However, a few schools do not do enough to measure whether the progress pupils make is greater than would be expected over time.
- 67 A few schools and local authorities track the progress of pupils after they leave the programme, to measure whether they continue to improve. In key stage 2 and 3, most of these schools report that many of the pupils gain the expected level at the end of the key stage. These results represent very good achievement given the nature of the pupils on the intervention programmes. However, the majority of schools and local authorities do not track pupils well enough to know whether these pupils continue to improve or whether the programmes represent value for money.

Summary

- 68 Features of the most effective intervention programmes include:
- active involvement of headteacher and members of the senior leadership team in monitoring and evaluating the quality of the provision and the standards pupils achieve;
 - close collaboration between intervention tutors, class teachers and subject leaders;
 - appropriate selection of pupils;
 - efficient tracking to identify where the programme is most effective;
 - involving parents from the start of the programme and helping them to support their child at home; and
 - high-quality training and support from the local authority.

Numeracy as a skill across the curriculum

- 69 Standards of numeracy are stronger in key stage 2 than in key stage 3. In general, pupils in key stage 3 do not have as many opportunities as pupils in key stage 2 to practise their numeracy skills outside their mathematics lessons.

Primary schools

- 70 In most primary schools, the same teacher teaches pupils mathematics and other subjects. This teacher is aware of the level of pupils' numeracy skills and can identify appropriate opportunities to use these skills in other subjects.
- 71 Primary schools with good standards of numeracy make sure that pupils apply their numeracy skills well in a range of situations. Many of these schools identify the numeracy skills pupils require in other subjects and help pupils to cope with these demands. These schools identify opportunities for pupils to reinforce and practise their numeracy skills in these subjects. They also organise a range of whole-school projects and activity days that focus on numeracy. These activities enable pupils to improve their numeracy skills further and also highlight the use of numeracy in real-life contexts.

Secondary schools

- 72 Too few secondary schools have well-established strategies to develop pupils' numeracy skills across the curriculum. Many schools do not make enough use of subjects across the curriculum as practical and relevant contexts for pupils to develop and apply their numeracy skills. As a result, even when pupils have good numeracy skills, they often lack confidence in using these skills in unfamiliar contexts and other subjects.
- 73 In many schools, teachers tell pupils at the start of the lesson the skills that pupils will use. However, many teachers in subjects across the curriculum do not take enough advantage of opportunities to practise and reinforce the skills pupils have learned in mathematics lesson when appropriate.
- 74 In many lessons across the wider curriculum, the numeracy demands of a subject may legitimately be pitched below the level of numeracy that pupils have already mastered. However, in a minority of lessons teachers of subjects across the curriculum have too low expectations of pupils' numeracy skills and set tasks which are too easy, even where more demanding work would be appropriate in that subject. In these lessons, teachers often carry out calculations for pupils, even when pupils are capable of doing these calculations themselves, or they allow pupils to use calculators for basic calculations that the pupils should do mentally.
- 75 Many secondary schools now have a numeracy co-ordinator to develop a whole-school approach to numeracy. The co-ordinators work with departments to identify the numeracy demands of the subject. Many also provide advice and training on the methods of calculation that are familiar to pupils and make sure there is a consistent use of mathematical terminology. This support is most successful when the co-ordinator has sufficient expertise and experience to be able to lead other staff and is given time and resources to carry out the role.

- 76 However, the extent to which these actions have improved standards of numeracy varies too much. In many schools the initiative has not developed beyond initial meetings or a staff training day and has not had enough impact on the standards of pupils' numeracy skills.
- 77 In a few schools, teachers have embedded the initiative across the whole school and have seen an improvement in pupils' numeracy skills as a result. These schools have gained the co-operation of all departments and plan carefully to make sure that all teachers:
- understand the level of numeracy skills they can expect from pupils;
 - look for opportunities in their subjects for pupils to reinforce and practise the skills they have learned in mathematics; and
 - are aware of the methods and strategies used by the mathematics department.
- 78 These successful schools have adapted their schemes of work to make sure pupils are prepared for the numeracy demands of different subject areas. In many of the schools, the co-ordinator arranges a different numeracy focus each term and produces classroom display materials and documentation to support this focus. They also organise whole-school projects and activity days on numeracy. These activities successfully make sure that teachers are reminded of the need to continue to improve pupils' numeracy skills and to apply these in a range of contexts. The majority of these schools successfully enter pupils for key skills qualifications in key stage 3 and key stage 4.

Transition between key stage 2 and key stage 3

Links in mathematics and numeracy

- 79 Transition planning for mathematics between secondary schools and their partner primary schools has improved over recent years. All schools visited as part of the survey have direct links between secondary mathematics departments and teachers in their partner primary schools. In the majority of schools, teachers meet regularly. Nearly all clusters of secondary and partner primary schools have used these meetings to agree a common understanding of National Curriculum levels in mathematics. The majority are developing a common portfolio of pupils' work in mathematics to demonstrate these levels. Many secondary schools also receive specific information about pupils' attainment in mathematics from their partner primary schools, for example on sub-divisions of National Curriculum levels.
- 80 Working together has improved understanding between teachers in many primary and secondary schools. An increasing number of secondary schools ask primary colleagues to recommend which ability set in mathematics would be most suitable for pupils when they transfer to the secondary school. In the best practice, secondary school mathematics teachers provide primary teachers with regular information on the progress made by their former pupils during key stage 3.
- 81 However, planning for numeracy is not as well developed. Only a very few schools transfer specific information about pupils' numeracy skills, such as the progress pupils have made on numeracy intervention programmes and the areas that still need to be addressed. Most schools do not share delivery of these catch-up programmes enough between Year 6 and Year 7.

Curriculum projects to provide specific information on pupils' skills

- 82 In a few clusters, teachers from the secondary and primary schools use their meetings to discuss the methods of calculation used in mathematics lessons. As a result, these schools have adopted consistent methods of teaching mental and written calculations in number in both key stage 2 and key stage 3. In general, however, secondary schools do not do enough to make sure that pupils' numeracy skills continue to improve when they move into Year 7. Many teachers in key stage 3 do not build on the methods pupils have learned in primary schools because they do not place enough emphasis on teaching effective strategies for mental and written calculation. In a minority of secondary schools, pupils learn 'tricks' which cannot be developed into a standard method of calculation as their understanding improves. In these schools, teachers do not do enough to develop pupils' understanding of the number line or teach pupils to use calculators effectively enough.
- 83 The majority of clusters of secondary and primary schools organise 'bridging units' in mathematics where primary teachers start a unit of work in Year 6 that secondary teachers complete at the start of Year 7. In the best examples, these units build on the progress pupils made in the primary school and raise the Year 7 teacher's expectations of pupils. However, in general, these activities do not focus enough on

numeracy. Many secondary schools do not evaluate rigorously enough the impact of the 'bridging units' in raising standards in Year 7

- 84 Increasingly, clusters of primary and secondary schools replace the bridging unit with a skills project. The most successful examples provide opportunities for pupils to gain a key skills qualification in Application of Number at level 1 during Year 7. Gaining a qualification early in key stage 3 motivates pupils well and many go on to gain a level 2 qualification in Year 9 or Year 10.
- 85 In a few schools, 'bridging' activities only involve games and puzzles which are not directly related to the mathematics curriculum. In these clusters of schools, primary and secondary teachers do not share enough first-hand evidence of pupils' work to know the standard they are capable of. As a result, pupils often repeat work they have already mastered in their primary schools and their mathematics lessons in Year 7 are not challenging enough.

More-able and talented pupils

- 86 Many of the secondary schools visited for the survey offer opportunities for more-able and talented pupils from partner primary schools to take part in extension or enrichment activities in numeracy during Year 5 and Year 6. These vary between whole-school activity days, after-school 'master' classes and groups withdrawn from normal lessons. More-able and talented pupils enjoy these activities and appreciate the opportunity to stretch their understanding in mathematics. However, most schools do not make any different provision for these pupils when they arrive in Year 7 and pupils do not have the opportunity to undertake sufficiently challenging work in their mathematics lessons.

Leadership and management in schools

- 87 The most successful numeracy initiatives are effective because of the strong leadership of senior managers in the school. These managers drive the initiative well and provide funding for resources and sufficient opportunities for whole-school training. In these cases, all teachers understand that numeracy is an important priority for the school. These schools include programmes to improve standards of numeracy in the school development plan and, where appropriate, in all subject development plans. These initiatives are regularly on the agenda for meetings of staff.
- 88 In the majority of schools, the expertise, leadership and commitment of staff responsible for mathematics and numeracy contribute significantly to the success of initiatives to improve numeracy. These teachers have good subject knowledge and inspire, support and lead colleagues very well. They are aware of, and use well, a range of resources from the Welsh Assembly Government, Basic Skills Cymru and their local authority to support initiatives to improve numeracy. They plan well to make sure pupils have a range of interesting opportunities in which to practise their numeracy skills. In a few schools the outstanding contribution of teaching assistants has also contributed to improvements in pupils' standards of numeracy.
- 89 Schools that have made the most progress in developing numeracy across subjects link their work in numeracy with other initiatives to improve teaching and learning, for example assessment for learning, thinking skills and strategies to improve boys' attainment.
- 90 One of the most influential factors in continuing to improve numeracy in the most successful secondary schools is having a well-established numeracy group within the school, representing most, if not all departments. This group makes sure that there is good communication and that all departments receive information, training and reminders of ways of using numeracy well. Members of the group act as numeracy 'champions' within each subject and drive the initiative within that subject. The most effective groups also include a member of the senior leadership team.
- 91 In the best practice, primary and secondary schools have clear policies to make sure there is a consistent approach to numeracy across the school and that numeracy regularly features on the agenda of staff meetings. All staff are aware of the numeracy policy and the levels of pupils' numeracy skills.
- 92 Many schools monitor and evaluate the quality of pupils' work in mathematics through lesson observations, book scrutiny and analysis of end-of-key-stage assessments. In a few schools, the evaluation of standards of pupils' numeracy skills across all subject areas is also included in this monitoring and review.
- 93 However, in general, schools do not do enough to evaluate the effectiveness of the provision for numeracy or to judge the impact on pupils' numeracy skills. They do not measure the impact of different numeracy initiatives rigorously enough to plan effectively for further improvement. The majority of schools do not track the improvement in pupils' standards as a result of any numeracy catch-up groups well enough to evaluate the contribution of these programmes to improving end-of-key-stage attainment.

Continuing professional development

- 94 Teachers in the schools with the most effective strategies for improving standards of numeracy have been involved in national training from Basic Skills Cymru and other organisations. They often also receive good quality support from their local authority.
- 95 The most effective training courses take place over several days and require teachers to take part in classroom-based research between these days. In the best practice, these projects have a significant impact on provision for numeracy in the school. The disadvantages of releasing a member of staff from school are outweighed by the positive benefits to the school.
- 96 Courses of this type include the modules for the Basic Skills Cymru diploma. This training challenges teachers to rethink their practice and has often reinvigorated their teaching. It has the greatest impact on standards of numeracy when these teachers are part of a strategic group in the school.

The work of local authorities

- 97 Local authorities have a key role in making sure that schools give priority to developing pupils' numeracy skills and in providing support and resources that enable schools to do so.
- 98 In most authorities, there are a range of initiatives to support numeracy in key stage 2 and key stage 3 such as numeracy catch-up programmes, assessment for learning, Cognitive Acceleration in Mathematics Education (CAME), family numeracy programmes and transition initiatives. Many authorities use designated numeracy advisers to provide support for schools or share this provision with other authorities. Overall these advisers provide good support and resources to help schools develop pupils' numeracy skills in key stage 2. A very few of them provide outstanding support. However, there is inconsistent specialist support for numeracy in key stage 3.
- 99 Many local authorities provide good-quality training for mathematics and numeracy subject leaders in primary schools and organise regular network meetings to share good practice. A minority provide the same support for heads of mathematics and numeracy co-ordinators in key stage 3. A very few local authorities offer regular network meetings for teaching assistants to provide extra training and to share good practice. Officers often also invite subject leaders or other staff to these meetings.
- 100 Many local authorities provide training to support numeracy catch-up programmes. Officers design training to equip teachers and teaching assistants to deliver the programmes. A few authorities also provide training for older pupils who give numeracy support to younger pupils in key stage 3. Most schools rate this training as very good or excellent and consider that it significantly improves the quality of the programmes. However, a minority of local authorities do not monitor the impact of this training and are not aware how many schools offer successful catch-up programmes or the number of pupils that benefit.
- 101 Many authorities make good use of resources and funding grants including those from the Welsh Assembly Government such as Better Schools Fund, Basic Skills Cymru funds and RAISE, to support numeracy programmes. Increasingly, authorities target carefully these resources on those schools where standards of numeracy need to improve the most. A few authorities manage these projects very well and evaluate their impact rigorously.
- 102 In a few local authorities officers track carefully the progress pupils make during catch-up programmes. If data suggests that pupils in particular schools are not making enough progress on the programmes, officers identify the school for further training and also monitor the quality of the provision in the school. These authorities require schools to sign agreements before receiving materials and training to confirm that schools will provide the necessary data and release teachers to attend meetings. However, the majority of local authorities do not monitor rigorously enough the quality of intervention programmes in their schools or track the attainment of these pupils to the end of the key stage.

Appendix 1: Case studies of good practice in improving pupils' numeracy skills

Numeracy Intervention Programmes

Hawarden High School, Flintshire, 906 pupils: Numeracy Buddies

Strategy

Sixth formers act as numeracy 'buddies' for Year 7 pupils who need support to improve their numeracy skills.

Action

The 'buddies' meet pupils once a week during registration and use the Number Workout materials from Basic Skills Cymru. The school's numeracy co-ordinator trains these sixth formers, with support from the local authority.

The school tracks well the progress that pupils make after they have finished their involvement with the 'buddies' programme. They evaluate the success of the programme by monitoring the number of these pupils who eventually gain a grade C in mathematics at GCSE.

Outcomes

About half the pupils maintain their improvement throughout the school and gain at least a grade C before leaving.

The sixth formers who act as 'buddies' also benefit from taking part in the initiative. They gain credit towards key skills qualifications in working with others and for the community support element of the Welsh Bacalaureate Qualification.

Ysgol Bryn Elian, Conwy, 941 pupils: Numeracy Skills Booklets

Strategy

Teachers use a numeracy booklet during registration to improve all pupils' numeracy skills. Many of the activities in these booklets are linked to other subject areas.

Action

The school also identifies those pupils with low basic skills at the start of Year 7. Sixth formers support these pupils during registration and help them to complete their numeracy booklets.

The numeracy co-ordinator is released from his own registration class once a week to visit other classes to monitor the use of the numeracy skills booklets. The progress made by individual pupils is included in their one-to-one target reviews. The sixth formers contribute to the monitoring of the progress of the pupils they support through discussion with the mathematics teachers.

Outcomes

Pupils benefit from practising their mathematical skills through a number of short, sharp mathematical activities. These provide a very good opportunity for pupils to consolidate their learning and reinforce methods and strategies.

Ysgol Bryn Elian, Conwy, 814 pupils: Numeracy Summer School**Strategy**

The school organises a literacy and numeracy summer school as their main transition initiative. Teachers concentrate on literacy in the first week and numeracy in the second. Partner primary schools identify pupils in Year 6 to join the activity who are not yet attaining level 4 but could do so with support.

Action

Teachers use interactive resources and mathematical games to make learning interesting and fun while reinforcing important number facts. Sixth formers also support the pupils and this contributes to their Welsh Bacalaureate Qualification.

The secondary school uses the information on the levels of these pupils' numeracy skills as a basis from which to monitor their progress through key stage 3 and key stage 4.

Outcomes

Pupils who attend the summer school enjoy it and recall the topics they covered well.

In the previous year, five former summer school pupils gained grade C in GCSE mathematics and one left Year 13 with 3 A levels and has gone on to higher education.

Newport City Council: Involvement of parents in intervention programmes**Strategy**

The local authority has very effective intervention programmes and says that involving parents is an important feature in the success of the programmes.

Action

Primary and secondary schools send letters to parents before the programme starts and many schools also invite parents to a meeting to discuss the programme. In addition, schools use newsletters to keep parents informed about the work their child is covering and the calculation strategies they are learning. These newsletters also provide examples of numeracy games that parents can play at home with their child. A minority of schools also offer numeracy workshops to parents to try these activities themselves.

The local authority provides the newsletters for the schools. It also provides questionnaires for schools to send to parents at the end of the programme.

Outcomes

Last year 88% of parents returned the questionnaires and all parents made positive comments. Parents were pleased with the improvement their children had made while taking part. They also appreciated the help they themselves had received to support their children with homework activities and said that they were now more confident to help their children.

Flintshire County Council**Use of an ICT package to improve pupils' numeracy skills****Strategy**

The local authority has used Basic Skills Cymru grants to provide primary schools with an individual learning ICT package to improve pupils' numeracy skills.

Action

Pupils use the computer for about 10 to 15 minutes, three or four times a week. As a result, a range of pupils benefit from the support during any week. The programme identifies those concepts that pupils find difficult, and provides focused support and further practice on these. It also tracks pupils' progress and provides useful reports that summarise this progress and identify any problems they are still experiencing.

The local authority has a good system to make sure that schools use the ICT package well and to track the progress pupils make. Before releasing this software to schools, the authority asks headteachers to agree to release staff for training on using the package and to send the authority an action plan explaining how they will use it. Schools must also identify at least 10% of the Year 5 cohort for support, carry out a baseline assessment using a standardised test and identify a member of staff to co-ordinate the work. At the end of the year, they must also submit data to the authority to show the impact of the materials on pupils' standards in numeracy and release the member of staff for a half-day evaluation meeting. The authority does not send the materials to the school until this guarantee is received.

The authority uses a common data form to transfer data from key stage 2 to key stage 3. This form usefully identifies any pupil who has been on an intervention programme so that their progress can be monitored at key stage 3.

Outcomes

Pupils enjoy their sessions on the computer and gain confidence because the software package is designed for pupils to experience success in 80% of the activities. Many pupils also improve their ability to calculate mentally. On the initial Year 5 pilot, 86% of pupils made progress on the standardised test at the end of the programme. One third of pupils made more progress than could normally be expected within the same period of time. Schools found the detailed reports on pupils' progress generated by the software package to be very useful for target setting.

Numeracy as a skill across the curriculum

Pillgwenlly Primary School, Newport, 554 pupils:

Developing numeracy as a skill in the primary school

Strategy

This city primary school has identified improving numeracy as a priority. The school has very high levels of free school meals and over 80% minority ethnic pupils.

Action

Teachers held a series of meetings to discuss all subjects in turn to identify opportunities for pupils to reinforce their numeracy skills. They also sampled pupils' work to judge the standards of these skills.

As a result of these meetings, teachers are all aware of the need to improve pupils' numeracy skills. The school has a thematic approach to learning and teachers had already identified opportunities for numeracy in most subjects.

The school has a comprehensive numeracy policy which covers common approaches to teaching and learning. It has made good progress in implementing the policy and in developing a consistent approach across the school. Lesson observations indicate that teachers have identified appropriate opportunities to reinforce pupils' numeracy skills in history, art and creative development, physical development, design technology, religious education and Welsh.

Senior leaders include the monitoring of the numeracy policy in whole-school review. Each year they write an evaluation of the numeracy policy, which includes the effectiveness of the policy in raising standards. This identifies areas for further development as well as celebrating success.

Outcomes

Despite the language difficulties of many pupils and the high levels of deprivation, nearly three-quarters achieve at least level 4 in mathematics by the end of key stage 2.

Milford Haven School, Pembrokeshire, 1281 pupils

Developing numeracy as a skill in the secondary school

Strategy

The school has had an initiative to develop pupils' numeracy skills across the curriculum since 2003 and has embedded it in their normal practice.

Action

The headteacher has taken a strong lead from the start and provides funding each year to make sure that teachers have the necessary resources and training. Numeracy is regularly on the agenda at head of department meetings, and is a priority each year in

the school development plan and in all department development plans. It regularly features in good practice sharing in-service training sessions. Every member of the mathematics department has responsibility for improving numeracy in specific subject departments as part of their job description. All staff are aware of the need to view themselves as teachers of numeracy as well as of their own subject specialism.

Every subject department identifies a numeracy representative who leads on developing numeracy in that subject. These teachers meet regularly in the School Numeracy Action Party (SNAP) to discuss and agree policies, decide on the use of funding and suggest ideas for continuing to develop numeracy. Through this group, all departments have adjusted their schemes of work to make sure pupils have met the necessary numeracy skills before they need them in other subjects across the curriculum. The co-ordinator provides group members with resources such as classroom displays or checklists to highlight the numeracy focus for that term. The co-ordinator also provides 'numeracy boxes' for each department. These contain relevant mathematical equipment for that department as well as examples of the resources used by the mathematics department. Most subject departments use these numeracy boxes well.

The co-ordinator organises whole-school numeracy weeks when all departments take a numeracy theme. All subjects join in with these activities and the quality of work produced is very good. The co-ordinator has also prepared a leaflet for parents outlining the methods of calculation used in the school.

Outcomes

Pupils are readily able to describe the numeracy skills they use in other subjects and naturally transfer these skills between their different lessons.

The following make a significant contribution to the success of the initiative:

- strong drive and support from the headteacher and members of the leadership team;
- clarity of roles for all staff from the headteacher to subject numeracy co-ordinator and classroom teachers;
- expertise and enthusiasm of the numeracy co-ordinator;
- very good lines of communication which keep all staff informed and remind them of the need to develop pupils' numeracy; and
- strong links with other school initiatives and with the whole school cycle of planning and review.

Transition between key stage 2 and key stage 3

Bryngwyn School, Carmarthenshire and its partner primary schools

Cluster catch-up programmes from year 6 to year 7

Strategy

The secondary school and its partner primary schools decided to run a common numeracy catch-up programme starting in Year 6 and continuing in Year 7, when pupils transfer to the secondary school.

Action

Teachers identify those pupils needing support with basic numeracy at the start of Year 6. These are not pupils on the SEN register, but are those unlikely to reach level 4 in mathematics at the end of key stage 2 without further support.

TAs withdraw pupils from lessons once a week for about one hour. Most primary schools run the programme during the afternoon. The secondary school arranges a rota to avoid pupils always missing the same subject.

All schools agreed on the topics they would cover before the start. TAs use resources based on the Number Workout file from Basic Skills Cymru, supplemented by the schools' own resources and those from the local authority. Local authority officers and secondary school staff trained the TAs before the project started. These TAs continue to meet regularly to share ideas and to compare progress.

The schools use a common test for the start and finish of the support to measure the progress pupils make.

The schools initially used RAISE funding to start the programme but now fund it from their own budgets because they have seen the benefits for their pupils.

Outcomes

Nearly all pupils make good progress and primary schools report that many of the pupils improve their numeracy skills enough to gain level 4 in mathematics at the end of key stage 2. Pupils continue to make progress as soon as they start the secondary school because the school is aware of their numeracy skills. The majority of these pupils achieve level 5 in mathematics at the end of key stage 3. In addition, pupils show more confidence in tackling number problems in mathematics lessons and a few are now in a higher mathematics set as a result.

Reasons for success include:

- the primary and secondary schools all give the lessons high priority and high status;
- there is very good communication between the secondary and primary schools and effective record keeping;
- schools make sure that the TAs have all the necessary resources;

- very good support and training from the local authority including demonstration lessons;
- all schools use consistent criteria to select pupils for support; and
- pupils are used to going to the lessons and are familiar with the materials.

Pontarddulais Comprehensive School, Swansea and its partner primary schools

Case study 9: Developing numeracy as a skill in a cluster of schools

Strategy

The comprehensive school, with its five partner primary schools, has developed a key skills project for pupils aged eight to 14. This project takes the theme of 'One Square Mile'.

Action

Pupils investigate all aspects of life within a square mile of their own school. Different year groups concentrate on identified communication, numeracy or ICT skills within different curriculum areas. During Year 6, pupils work on Application of Number and complete a project which uses all aspects of their numeracy skills. Year 6 teachers pass these projects on to the secondary mathematics department and many pupils gain level 1 in the key skills qualification of Application of Number as a result.

Teachers from all the schools involved met during training days to identify the relevant skills and plan the activities. All schools in the cluster worked together to clearly identify the numeracy content to be covered in Year 6. They agreed the materials they would use and the expected standards of numeracy.

Outcomes

Pupils report that they really enjoy the project-based approach and are very positive about being able to gain a qualification at the start of their time in secondary school.

The factors contributing to the success of this project include:

- the well established links between the schools;
- the time taken during INSET days to identify the skills to be covered and to prepare materials;
- the involvement of the deputy headteacher from the secondary school who co-ordinated the project and made sure that it was successful; and
- funding from the Better Schools Fund, provided by the secondary school to support joint INSET and other activities.

Pontarddulais Comprehensive School, Swansea, 795 pupils

Extension classes for more-able pupils in Year 6

Strategy

The secondary school pays for an experienced numeracy teacher to visit each of their partner primary schools every week to teach an extension class for Year 5 and Year 6 pupils.

Action

The teacher has developed a series of activities using ICT that stretch pupils' understanding of number, introduce them to new content and challenge them to think more deeply.

Outcome

Pupils who attend these lessons enjoy being challenged by the more stretching work and make very good progress. The secondary school is now considering how to continue to challenge these pupils when they are in year 7.

Leadership and management in schools

Llangennech Junior School, Carmarthenshire, 182 pupils

Management of numeracy and mathematics to raise attainment in a primary school

In this junior school, the mathematics subject co-ordinator investigated what pupils thought about mathematics as a classroom research project for a middle management course.

Action

As part of this investigation, he interviewed 48 pupils, 12 from each school year. He discovered that, although most pupils had a positive attitude to mathematics as a subject, they did not think that it had any relevance outside mathematics lessons. In addition, they could not think of examples where they used numeracy in other subject areas. The teacher also interviewed teachers in the school and discovered that they did not actively promote the use of numeracy in other curriculum subjects.

As a result of the survey, teachers in the school raised the profile of numeracy in all subject areas, and identified opportunities to reinforce and practise pupils' numeracy skills in all foundation subjects at least once every term. The co-ordinator organises mathematics weeks when all classes focus on specific activities related to the use of mathematics. The school holds meetings to make parents aware of the school focus on numeracy and how parents can support this.

Teachers found that these strategies quickly made an impact. They include numeracy in all the school's planning documents. Foundation subject lessons have numeracy explicitly taught and developed within several of the activities.

Outcomes

Pupils are now more aware of numeracy as a general skill and are able to apply number well in a range of different contexts.

In 2009, the percentage of Year 6 pupils gaining at least level 4 in mathematics improved and is well above the Wales average. The school compares its performance with others in its family of schools from the All Wales Core Data Sets from the Welsh Assembly Government. Performance in mathematics at both level 4 and level 5 is now one of the best in this family.

Bryngwyn School, Carmarthenshire, 1000 pupils**Management of numeracy and mathematics to raise attainment in a secondary school****Strategy**

In this 11-16 secondary school, the mathematics department has a very strong culture of self-review. This school has a higher percentage of disadvantaged pupils than the average across Wales.

Action

The department analyses thoroughly pupils' performance at the end of each key stage. Teachers track pupils' progress very effectively through the school. They compare performance to estimates from the previous key stage, from predictions from national standardised tests and to value-added data. The department also tracks the performance of specific groups including looked after children and those who receive free school meals. They seek to meet the needs of all pupils while continuing to set high expectations for pupils' attainment.

The department has a culture of staff learning from one another and teachers are confident to identify their own areas for improvement. Each member of staff writes an evaluation of the mathematics results for the pupils in their groups compared to baseline data and performance estimates. These evaluations are comprehensive and honest and identify useful areas for development in order to improve provision further.

All members of the department have carried out peer observations as part of their continuing professional development. They monitor the standards of numeracy in pupils' mathematics books and in pupil trails to assess these skills across the curriculum. Schemes of work for Year 7 and Year 8 contain units on numeracy to make sure that pupils continue to improve these skills as soon as they join the school.

The department places an emphasis on pupils gaining key skills qualifications. The school and department development plans contain targets for the percentage of pupils gaining a qualification in application of number as well as targets for performance at the end of key stage 3 and in GCSE mathematics.

Outcomes

In 2009, all pupils in Year 9 gained a qualification in application of number, 80% of these at level 2. The department has found that gaining key skills qualifications in

key stage 3 motivates pupils to gain further qualifications. The percentage of pupils gaining the expected level in mathematics in National Curriculum assessments at the end of Year 9 is above average for similar schools and the percentage gaining the higher level 6 and level 7 is above the average for Wales.

Pupils maintain their motivation into key stage 4 and the percentage gaining a level 2 qualification in mathematics at the end of key stage 4 is among the best in their family of similar schools and has consistently been in the top 25% of similar schools across Wales in recent years. In addition, in 2009, 14 pupils gained a level 3 qualification in application of number in Year 11.

Pontarddulais Comprehensive School, Swansea, 795 pupils

Monitoring standards of numeracy in a secondary school

Strategy

Members of the senior leadership team co-ordinate key skills very well across the school. Their aim is to:

- embed the key skills of communication, numeracy and ICT throughout the curriculum;
- raise pupils' standards in these basic and key skills;
- help pupils to transfer these skills between subjects across the curriculum; and
- enable all pupils to gain qualifications on the key skills by the end of key stage 3.

Action

The school has a key skills co-ordinator and also numeracy and literacy co-ordinators and key skills 'champions' in each curriculum area. The school development plan identifies key skills as a priority each year. Every teacher has a responsibility to develop key skills as a performance management objective. The school has a clear and detailed key skills policy and teachers had identified key skills in all schemes of work. However, the senior leadership team had concerns about how effective this was in improving pupils' skills.

Twice a year senior leaders carry out a themed whole-school review and they include key skills in these reviews every two years. Senior leaders observe lessons and scrutinise pupils' books across the whole curriculum looking for evidence of the standards of pupils' skills. These leaders write a comprehensive report for all staff as a result of the review. This report describes pupils' standards in each of the key skills, with an emphasis on communication and numeracy. It also highlights good practice and raises staff expectations of the levels of literacy and numeracy they can expect from pupils.

Outcomes

All pupils have the opportunity to gain key skills qualifications, including application of

number, by the end of key stage 4. Many pupils gain level 1 application of number during Year 7.

Work of local authorities

Carmarthenshire County Council

Support for key stage 2 intervention in a large rural authority

Strategy

The authority supports schools in setting up numeracy intervention programmes for pupils who are falling behind their peers. They provide training for school staff to run these programmes. However, when officers monitored the programmes they found that a minority of schools needed further support to improve this provision.

Action

The authority uses Basic Skills Cymru grants to second a part-time teacher to support these schools. The teacher visits the school for support on one day a week for seven weeks. Initially she delivers the first unit of the intervention programme with the TA observing. This pattern continues for a few weeks with the advisory teacher gradually handing over responsibility to the TA. The TA completes the remaining units after the visiting teacher completes her visits.

The authority asks headteachers to sign agreements before this support agreeing that the TA will attend all sessions with the teacher and complete all the sessions with pupils. They also agree to the authority monitoring the provision. Pupils are tested using a standardised mathematics test and pupils with a score between 80 and 90 are chosen for support.

The teacher visits the schools at the end of term to monitor the intervention and observe sessions. At the end of the programme, pupils are re-tested to measure the impact of the programme. The authority monitors this progress and highlights areas for further improvement in pupils' numeracy skills.

Outcomes

Many of the pupils supported make very good progress while attending these sessions. Local authority officers are well-informed about the quality of intervention programmes in primary schools and the progress made by pupils.

Newport City Council

Effective tracking of numeracy catch-up by a local authority

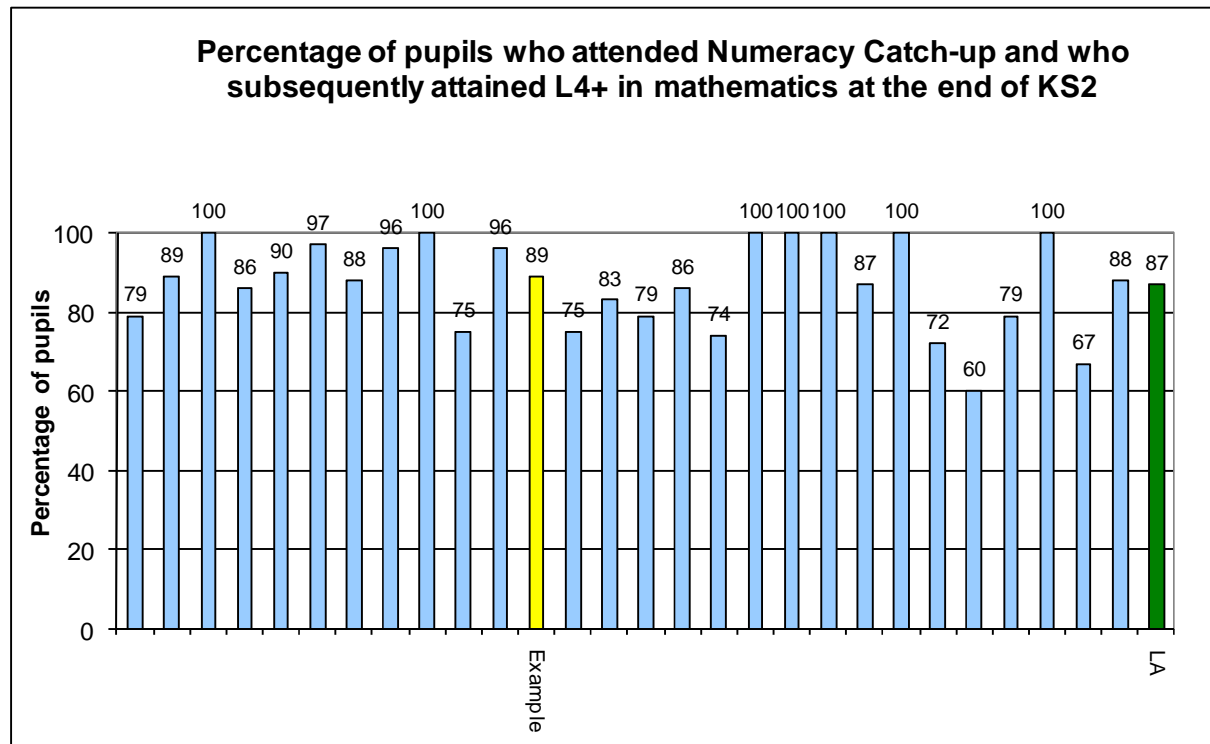
Strategy

The local authority supports its schools very well with high-quality training and resources for numeracy intervention programmes in key stage 2 and key stage 3. It has effective systems to track the progress made by pupils on these programmes until the end of the key stage.

Action

Each year officers compile a report on the progress made by catch-up pupils to help schools to evaluate the effectiveness of their own programme. If officers identify that pupils in a school are not making enough progress, the school is asked to outline the measures they will put in place to address this. No further funding is given until this action plan is received.

The use of data to evaluate these programmes is a regular feature at subject leader meetings and the effectiveness of the school's tracking processes is part of the assessment for the Basic Skills Quality Standard.



Schools receive a graph similar to the example above. This shows the percentage of catch-up pupils in each school who achieved at least level 4 in mathematics at the end of Year 6. The individual school is shown in yellow and the authority average in green.

Outcomes

There were 412 such pupils in Year 6 in 2008-2009 and 87% gained a level 4 or above in mathematics. About 360 pupils were able to achieve level 4 who might not have done so without the intervention. In 2009, there were 237 pupils in Year 9 who had participated in the authority's own Numeracy Acceleration catch-up programme when they were in Year 7. At the end of key stage 3, 66% of these pupils gained level 5 or above in mathematics.

This success contributed significantly to the local authority having the highest percentage of pupils attaining level 4 or above in mathematics in key stage 2 in 2009 and to being above the Wales average in key stage 3. This authority has a higher free-school-meals figure than the Wales average and has the second highest percentage of minority ethnic pupils in Wales.

Appendix 2: Questions for leaders and managers to use in reviewing and improving practice

The questions in this section are designed to help schools to review and evaluate areas of their work in improving pupils' standards of numeracy and developing numeracy skills across the wider curriculum.

Numeracy intervention programmes

- Does the school use intervention strategies that have a proven track record so that pupils can catch up with their peers?
- Does the school have effective means of identifying pupils who need support to improve their numeracy skills?
- Do teaching assistants and 'peer buddies' who deliver the programme receive appropriate training?
- Do teaching assistants have the necessary resources always available to them, sufficient support to analyse pupils' progress and opportunities to share this analysis with other staff?
- How is the progress of pupils on numeracy intervention programmes communicated to the class teacher or the mathematics subject leader?
- Are classroom teachers aware of the teaching and learning strategies and the resources used in numeracy intervention programmes? Do they use similar strategies and resources in mathematics lessons?
- Does the school provide parents with opportunities to develop their own numeracy skills or to become familiar with the numeracy teaching strategies in the school?

Numeracy as a key skill across the curriculum

- Do all staff view themselves as teachers of numeracy?
- Do mathematics subject leaders and numeracy co-ordinators work with other teachers to:
 - plan opportunities for pupils to apply and improve their developing skills in numeracy in subjects across the curriculum, where appropriate;
 - agree common teaching and learning strategies for numeracy; and
 - adjust mathematics schemes of work to make sure pupils learn the necessary skills in numeracy before they need them in other subject areas?

- Is there a termly focus for improving numeracy, for example, methods of subtraction or using appropriate graphs to illustrate data?
- Do all staff have sufficiently high expectations for pupils' numeracy skills?
- Is there a clear calculator policy and do staff apply this consistently?
- Do staff understand the level of numeracy skills that can be expected from individual pupils so that tasks involving numeracy are pitched at the right level?
- Do staff understand how best to support those with low numeracy skills?

Transition from key stage 2 to key stage 3

- Is information on the numeracy skills of under-attaining pupils passed on by partner primary schools? If so, how is this information used?
- Do staff plan ways to make sure that pupils make the best possible progress when they transfer from Year 6 to Year 7?
- Does planning in mathematics in key stage 3 consolidate and develop further the numeracy skills that pupils developed in key stage 2?
- How well do mathematics teachers in key stage 3 understand the numeracy skills that pupils have been taught in key stage 2 and the teaching strategies these pupils are familiar with?
- Do mathematics teachers in key stage 3 put enough emphasis on teaching effective mental and written calculation skills and on improving pupils' recall of basic number facts?
- Are more able and talented pupils stretched to work at their highest level after they transfer from Year 6 to Year 7?
- Are there bridging units of work that link work done in Years 6 and Year 7 that staff plan and assess together? Is there sufficient emphasis on numeracy in these units of work?
- Do primary and secondary school staff assess and moderate work of Year 6 pupils together and use portfolios of work that they have put together to agree levels of achievement in numeracy? Do these teachers also assess and moderate the work of Year 9 pupils?

Effective leadership and management in schools

- Do the headteacher and senior leaders give status to the work in numeracy throughout the school and make sure, where appropriate, it is a whole-school priority?

- Does the school have a whole-school numeracy policy? How effective is this policy in improving pupils' numeracy skills?
- Does the improvement of pupils' numeracy skills feature in the school development plan? In secondary schools, do all departmental development plans reflect this priority, where relevant? Is progress on any numeracy initiatives on the agenda for senior and middle managers meetings?
- Does the person responsible for leading the improvement of numeracy skills have the necessary experience and expertise in teaching mathematics?
- Do senior managers have a well-planned programme to review and evaluate the impact of numeracy initiatives and do they use findings to plan further improvement? Do senior managers seek learners' views on numeracy as part of this review?
- Does the school make good use of Better Schools Fund and Basic Skills Cymru grants to improve standards in numeracy?
- Do heads of mathematics in key stage 3 evaluate the impact of bridging units on pupils' standards of numeracy in key stage 3?
- Do staff receive regular and relevant training and support on appropriate learning and teaching strategies to improve numeracy?
- Do senior managers monitor the standards of pupils' numeracy skills during regular review and sampling of pupils' books?
- Do senior staff and mathematics subject leaders have effective processes to track the progress of pupils involved in intervention strategies? Do they track the continuing progress of these pupils after the support is finished?

The work of local authorities

- Does the authority have a whole-authority numeracy strategy which includes the development of pupils' numeracy skills across the curriculum?
- Are resources from a range of sources, for example, from the authority, the Welsh Assembly Government and Basic Skills Cymru, targeted to improve numeracy in those schools which face the greatest challenges?
- Does the authority provide a good range of guidance and exemplar materials for teaching and assessing numeracy?
- Can both primary and secondary schools access specialists who provide training and support to help improve the teaching of numeracy?

- Does the authority monitor the effectiveness of any training to support numeracy intervention programmes. Are officers aware of the number of schools operating these programmes and the number of pupils who benefit?
- Does the authority track the progress made by pupils on these programmes? Do officers know the attainment of these pupils at the end of the key stage?
- Does the local authority help primary and secondary schools to work together to make sure that pupils' numeracy skills continue to improve as they move from Year 6 to Year 7?

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