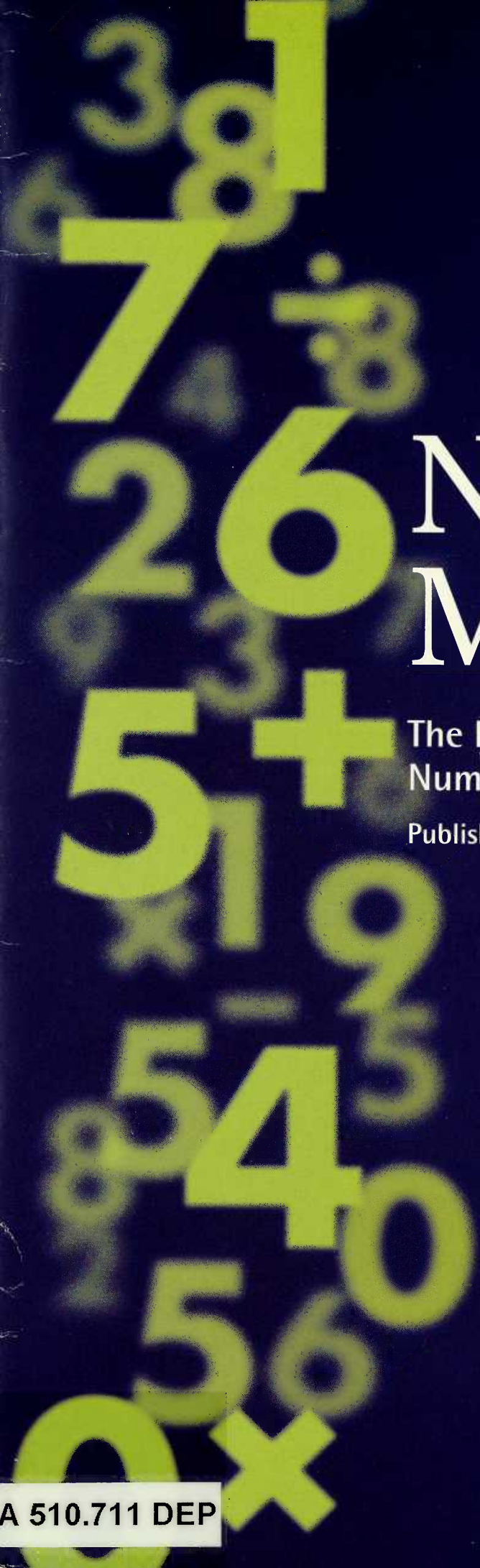

Numeracy Matters

The Preliminary Report of the Numeracy Task Force

Published for consultation January 1998

DfEE
Department for Education and Employment

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Foreword

Numeracy matters to every one of us. For individuals, the skill of numeracy is essential to take full advantage of a complex modern society and its opportunities. For society, numeracy matters to enable us to compete internationally.

This report reflects the views of the Numeracy Task Force about how we can generate more numerate individuals in a numerate society. We have deliberately set out to be evidence-based, rather than to adopt any particular "faiths" about numeracy and numeracy teaching. We have deliberately set out to be open-minded, and have looked at the experiences of countries other than our own in order to learn from them. We have also set out to build on those areas where we currently have excellent provision and excellent results.

The important thing now is that as teachers, parents, educationists and others read this document, you let us know your reactions to our diagnosis of the numeracy problem, to the outcomes we think a national strategy should achieve and to our recommendations for action. Are our recommendations likely to lead to the fulfilment of the remit David Blunkett gave us, of ensuring that 75% of 11 year olds achieve Level 4 or better by 2002?

We look forward to hearing from you.

Professor David Reynolds
Chair, Numeracy Task Force

Numeracy Task Force

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Contents

Summary of recommendations

The Task Force has made recommendations for a National Numeracy Strategy that we believe will improve standards and raise expectations in primary mathematics. We have sought to spread existing best practice widely, and our recommendations build in particular on the National Numeracy Project. The recommendations include:

- Training for headteachers, governors and mathematics co-ordinators in all primary schools and in special schools, to enable them to manage, monitor and support effective teaching and learning of mathematics at Key Stages 1 and 2.

- A daily mathematics lesson in all primary schools of between 45 minutes and one hour, depending on the age of pupils, with a high proportion of these lessons spent on numeracy.

- Training for primary teachers to ensure that the daily lesson will allow pupils to reach a high standard of numeracy. The training will cover mathematics subject knowledge relevant to the primary curriculum and pupils' later development, and effective teaching methods, including:

    - regular oral and mental work that develops pupils' calculation strategies and recall skills;
    - devoting more time in mathematics lessons to direct communication with pupils, particularly by teaching the whole class together, using good questioning techniques;
    - knowing when it is appropriate to use different forms of classroom organisation, including whole class teaching and different kinds of group work;
    - instructing pupils, demonstrating and explaining ideas and concepts, and modelling these in a variety of contexts;
    - detailed lesson planning; and
    - assessing pupils' progress both formally and informally, and identifying and correcting misconceptions.

- An action plan to raise standards of numeracy developed by each primary school in the light of the training. These plans will include targets for improvement, arrangements for monitoring progress, and an ongoing commitment to staff development in mathematics.

- A management structure similar to the National Literacy Strategy to support this training at national and LEA level.

- A greater emphasis on oral and mental work in the National Curriculum for mathematics, to secure the foundations of numeracy before formal written methods are introduced.

- Training to encourage the effective use of classroom resources and information and communication technologies (ICT) to enhance the teaching and learning of mathematics.

- Exploration of ways in which secondary schools can best build on pupils' mathematical achievements at primary school, including a pilot programme of summer numeracy schools to help address the problems of transition between Key Stages 2 and 3.

- A high profile, educational emphasis in the UNESCO sponsored World Mathematical Year 2000, involving the media, business, parents, schools and other partners in creating a national climate in which mathematics is seen as relevant and enjoyable.

- Homework guidelines to help parents play an active and enjoyable role in helping their children to become numerate.

- Measures to ensure that the work of OFSTED, QCA and TTA give appropriate emphasis to numeracy, and the factors that make for effective teaching and learning of mathematics.

- Research on existing innovative programmes of mathematics teaching to establish the factors associated with improvement in different school contexts.

1 The remit and methods of the Numeracy Task Force

Introduction

1 One of the first acts of the new Labour government was to announce national targets for literacy and numeracy. These are:

- for 80% of 11 year olds, by 2002, to achieve the standards expected for their age in English, i.e. Level 4 in the National Curriculum tests; and
- for 75% of 11 year olds, by 2002, to achieve the standards expected for their age in mathematics.

2 The Numeracy Task Force was established by David Blunkett, Secretary of State for Education and Employment, in May 1997. It was asked to develop a national strategy to raise standards of numeracy in order to reach the national numeracy target by 2002. Our recommendations therefore inevitably focus on numeracy in primary schools. The Task Force was asked to take into account relevant national and international evidence, including evidence about wider educational and social factors affecting performance. We have also taken into account comments about numeracy offered in response to the government's White Paper, *Excellence in schools,* and comments offered to the Task Force during its work, both those volunteered to us and those from people with an interest in numeracy whom we specifically consulted.

Structure of this report

3 The first three chapters of the report set out the Task Force's views about this evidence. After each section, desired outcomes for a National Numeracy Strategy are proposed in the light of the evidence. Chapter 4 explains how the Task Force moved from these desired outcomes to recommendations. Chapter 5 sets out the preliminary recommendations themselves, and lists a number of questions for consultation. We should particularly welcome responses to these questions, as well as any comments on other aspects of the report.

4 We are consulting a wide range of people about this preliminary report, including teachers, teacher organisations, teacher trainers, LEAs, organisations with an interest in mathematics, parents and employers. The Task Force's final

report to the Secretary of State will take into account the views received during consultation. It will be published in time to feed into decisions about the grants that will come from the DfEE's Standards Fund in 1999-2000, through which the implementation of the National Numeracy Strategy will be funded. The implementation of the National Literacy Strategy begins in 1998/99. The implementation of both strategies will be overseen by the Literacy and Numeracy Strategy Group established by the DfEE's Standards and Effectiveness Unit. The group includes experienced educators and representatives of OFSTED, QCA, TTA and the Basic Skills Agency. One of its key tasks will be to ensure that the strategies together are seen as coherent in schools and do not overload teachers. The Task Force has also borne this need in mind in framing its recommendations.

Why numeracy matters

5 Numeracy and literacy are both important in enabling children to access the full curriculum, and, later, to play a full part in adult working and social life. But a failure to be numerate is often seen to be somehow more acceptable than a corresponding failure to be literate. Society also tends to underestimate the extent to which a lack of numeracy skills holds people back. One quarter of the adults taking part in a Basic Skills Agency survey in 1997 had numeracy skills that would make it difficult to complete everyday tasks successfully. 9% of these people recognised or acknowledged their difficulty, as compared with 19% of people with poor literacy skills.[1]

6 People find life much easier if they can answer basic numerical questions, e.g. "What is the discount worth if it is 10% of £24.95?", "How much are 50 stamps at 26p each?". A good grasp of numeracy is also needed to manage personal financial affairs. This is increasingly important as more and more people assume responsibility for long term financial obligations such as hire purchase, mortgages, student loans and pensions. People need to be numerate, too, to interpret statements in the news about changes in unemployment figures or interest rates, or to interpret data in graphs or tables, such as weather charts or illustrations of insurance benefits. We hope that one of the effects of the Task Force's report, and the wide consultation on it, will be that more people understand the importance of numeracy as an essential life skill.

7 Early work in mathematics must begin to lay the foundations for the skills and insights children will use in later life. A solid grounding in numeracy at primary school will also help children with the mathematical skills needed in other

[1] J. Bynner and S. Parsons, *Does Numeracy Matter?* (Basic Skills Agency, January 1997)

subjects, and later, to develop the higher order mathematical skills that are indispensable for large areas of higher education and future employment, such as engineering, science, business, computing, economics and teaching.

8 The Task Force believes strongly that being fully numerate is an entitlement for all children. Reaching the national target for numeracy will be an excellent achievement, but it will nonetheless mean that some children have not attained this basic level of numeracy. A few children may be unable to reach the Level 4 target because of particular special educational needs, but these children, too, need to have the opportunity to reach whatever their full potential may be. In drawing up our recommendations, we have therefore looked towards a time when virtually all 11 year olds achieve the standard expected for their age.

What is numeracy?

9 Numeracy is an important part of mathematics, and a major aim of mathematics in primary schools is to teach children to be numerate. Primary schools teach National Curriculum mathematics as a whole subject, and numeracy should not be separated from it. Therefore, the government's national target for 2002, while focusing on numeracy, aims to raise standards of mathematics as a whole. The target offers an important goal for children's attainment in the National Curriculum tests in mathematics, but does not, in itself, explain what numeracy actually is. The Task Force therefore felt it important to have a clear definition of numeracy, in addition to the national target, to inform its work and responses to the consultation.

10 We adopted as our definition the one used by the National Numeracy Project:

> "Numeracy means knowing about numbers and number operations. More than this, it requires an ability and inclination to solve numerical problems, including those involving money or measures. It also demands familiarity with the ways in which numerical information is gathered by counting and measuring, and is presented in graphs, charts and tables."

11 The Project goes on to say that numerate primary pupils should:

- have a sense of the size of a number and where it fits into the number system;
- know by heart number facts such as number bonds, multiplication tables, doubles and halves;
- use what they know by heart to figure out answers mentally;

- calculate accurately, both mentally and with pencil and paper, drawing on a range of calculation strategies;
- recognise when it is not appropriate to use a calculator;
- make sense of number problems, including non-routine problems, and recognise the operations needed to solve them;
- have strategies for checking their answers to judge whether they are reasonable;
- explain their methods and reasoning using correct mathematical terms;
- suggest suitable units for measuring, and making sensible estimates of measurements; and
- explain and make predictions from the numbers in graphs, charts and tables.[2]

The national numeracy target

12 The national target of 75% of 11 year olds achieving the standard expected for their age in mathematics by 2002 is ambitious. The Task Force is convinced that it is achievable, for three main reasons:

- The government has committed itself to an extensive programme of educational reform to address the problem of underachievement generally. These general reforms will have some impact on the specific problem of mathematics.

- Primary schools are improving their results quite rapidly. The percentage of 11 year olds achieving Level 4 or better in Key Stage 2 mathematics tests was 62% in 1997, an improvement of 18 percentage points since 1995. Evidence suggests that this improvement may be due to a number of factors, including teachers' growing familiarity with the requirements of the National Curriculum and an increasing emphasis on pupils acquiring essential mathematical knowledge and skills. Progress at this rate may be difficult to sustain, but is certainly very encouraging.

- It is now possible to point with some confidence to teaching methods, ways of organising classrooms and other specific factors that are more

[2] National Numeracy Project, Crown Copyright, January 1998. More information about the National Numeracy Project can be found in Chapter 4.

effective than others in raising standards of numeracy. It is these factors in particular that the Task Force has set out to identify, and then to spread widely through its recommendations.

13 As noted above, it is important that the national target is used as a milestone on the route to achieving numeracy for virtually all pupils, rather than as an end in itself. It is therefore vital that schools do not only invest energy in helping the children currently closest to Level 4 to reach it. A national strategy should also help children who would otherwise achieve below Level 3 to improve their performance, and those already achieving Level 4 to reach their full potential, which may be well above the Level 4 threshold. This suggests that it might be helpful for schools to demonstrate publicly the improvements that all pupils are making.

14 At present, primary school performance tables show only the numbers of pupils achieving Level 4 or better. Schools are already required to report to parents the numbers of pupils achieving each level in the Key Stage 2 test, and we should be interested in views about whether this more detailed information should be publicly available in performance tables. We should also welcome comments on whether it is desirable to summarise more simply the information currently given to parents - whether or not this is made public - such as by showing the average level achieved by all pupils in a given year. QCA's recent consultation on target setting found widespread support for the use of average levels and this information will be available in the QCA's benchmark tables. The Task Force recognises that the reporting and publication of performance data is a sensitive issue for schools, which will need careful consideration by those responding to this consultation.

Achievement in numeracy

15 Studies comparing England's performance in mathematics with other countries show this country to be performing relatively poorly in comparison with others. For example, evidence from the Third International Mathematics and Science Survey (TIMSS) indicates that our Year 5 pupils (aged 9 and 10) are amongst the lowest performers in key areas of number out of nine countries with similar social and cultural backgrounds.[3] Other data from TIMSS suggest, however, that we also have areas of strength related to numeracy. For example, English pupils are comparatively very successful at applying mathematical procedures to solve practical problems, and have a positive attitude to mathematics as a subject.

[3] S. Harris, W. Keys and C. Fernandes, *Third International Mathematics and Science Study (TIMSS), Second National Report, Part 1* (National Foundation for Educational Research, 1997)

These are important aspects to preserve while we attempt to raise standards. It is important to raise standards both for the sake of the life chances of individual children, and for our international competitiveness.

Attitudes and expectations

16 English pupils tend to show greater confidence in their mathematical ability than pupils in many other countries, despite the fact that levels of attainment in number tend to be low. This may be because although English pupils meet the expectations of their teachers, the expectations are themselves comparatively low. Pupils in some of the countries where expectations, and corresponding levels of attainment, are high tend to have less confidence in their ability and a more negative attitude to mathematics. The challenge for teachers in England is to maintain pupils' positive attitudes, but to raise expectations, and the standards of numeracy. Effective teachers have high expectations of all pupils. They believe that all of them can acquire numeracy skills, even though some may take longer than others, and continually seek to move pupils' understanding forward.

17 Teachers who are confident about the mathematics they teach and are enthusiastic and effective, stimulate pupils' interest in the subject. Good initial teacher training, in-service training and support within the school can help. These allow teachers to deepen their mathematical knowledge and connect different elements of it together, by using research and other evidence to focus on and discuss different ways of tackling problems, and giving opportunities to share experiences and exchange ideas about classroom teaching. Targeted and structured activities of this sort can allow teachers whose attainment is initially modest, and who have a negative attitude to the subject, to identify their needs and gain mathematical knowledge and understanding. They can thus become enthusiastic and effective in the classroom, and take on a leadership role in mathematics in the school.

18 With all this in mind, the Task Force has aimed for a strategy to ensure that teachers teach mathematics effectively and pupils achieve high standards of numeracy. We also want teachers and pupils to be confident and positive towards the subject, and keen to use and develop their mathematical knowledge. We want teachers to have high expectations of their pupils, and constantly try to move them forward, especially in their mental capabilities. High expectations are regularly identified by OFSTED and QCA as a key factor in achieving high standards of mathematics. If teachers expect pupils to do well, pupils themselves will expect to succeed. This means pitching work at a high standard, setting a good pace to learning, and maintaining challenging, direct, active teaching.

The guiding principles of this report

19 Five key principles have guided the Task Force in preparing this report. These are:

- Looking at the evidence. Our aim has been to focus on evidence from research, inspection and practice about the problems with mathematics, and the methods that tackle these problems most effectively. We are of course aware that the content of mathematics in schools, in particular, has been the subject of vigorous debate in the past, but we have not set out to take part in detailed debate about the content of the National Curriculum. These matters will be for QCA to consider in their review of the curriculum. Outside this area, our overriding objective has been to set out our collective view of the evidence, particularly about effective teaching, and, in the light of this, to make practical proposals to raise standards of numeracy. We plan to make available a review of the research material we have taken into account during our work, when our final report is published.

- Building on existing best practice. The Task Force does not believe that any single "wonder drug" can solve all the problems of teaching mathematics. Criticism of mathematics achievement in the past has sometimes led people to advocate a complete change in the way it is taught. The problem with root and branch changes of this sort, however well-intentioned, is that they tend to eliminate not just the worst of what has been done before, but the best as well. The changes suggested have sometimes not yet been fully evaluated themselves, or may only have been seen to work well in a very different education system in a different country. Our aim has been to build on the existing teaching practices that work, whilst making clear those that do not, and recommending that these are replaced with different, more successful, practice.

- The best of both worlds. We believe that in the increasingly international perspective to discussions about education in all countries, successful countries attempt to get the best of both worlds. This means recognising and promoting what one's own country does well, but also attempting to learn from the achievements (and mistakes) of others. In this report, we have tried to benchmark against our own best practice, and propose ways of making that practice even better, by looking at the emphases, structures and organisations of other countries where appropriate.

- The importance of both school and home environments. Teachers have a vital and immensely challenging job. Teachers, as well as the children they teach, need the support of parents and the wider community if they are to

succeed in raising standards generally, and standards of numeracy in particular. We have therefore considered both school and external influences on a child's educational progress, and made recommendations that address both.

- Other developments in education. The recommendations of the Task Force are offered in the context of a number of other important developments and contributions, including the impending review of the National Curriculum, the work of OFSTED, the new national curriculum for initial teacher training, the new mandatory headship qualification, and existing programmes that aim to improve the quality of mathematics education, such as the National Numeracy Project. All these impact on the work of primary school teachers to a greater or lesser extent. We have tried to ensure that our recommendations work with the grain of what is already taking place in education, and focus on things that will help teachers, rather than merely imposing further burdens on them.

2 Factors that ensure success in teaching numeracy

Effective teachers in effective schools

20 As noted in the previous chapter, school and home influences are both important for a child's achievement generally, and in mathematics in particular. Home influences are discussed in chapter 3; here we concentrate on the effectiveness of schools in teaching numeracy, which currently varies widely. This needs to be rectified if all pupils are to have the fullest chance to succeed.

21 We have examined a good deal of research, both from this country and abroad, about what makes a school effective, including a considerable body of OFSTED evidence about mathematics teaching at Key Stages 1 and 2, and information about practices in countries such as Japan, Switzerland and the USA. Some of this evidence relates to the general level of effectiveness of the school, which will inevitably affect the quality of mathematics education. Some relates to what makes for effective mathematics education in particular. This chapter focuses on factors at both school level and classroom level that have been found to have the greatest impact on school and teacher effectiveness.

22 A number of government policies address the effectiveness of schools at the whole school level, such as LEAs' Education Development Plans, and the use of school performance tables to measure and encourage school improvement. Effectiveness at this level is necessary to raise standards of numeracy, but it is not sufficient on its own, since all available evidence indicates clearly that the teacher in the classroom is a more important determinant of achievement than the school. The main focus of the Task Force's work has therefore inevitably been at the level of teachers' individual effectiveness, as this will make the crucial difference to individual pupils' achievement in numeracy. Our overriding objective has been to help all teachers become as effective as the best in the teaching of numeracy, so that every child can achieve high standards. If teachers can be given the opportunity to improve their own professionalism and skills, they are more likely to reach this goal - the "high standards, high status" for teachers to which the government aspires.

School leadership of mathematics

23 A number of factors at school level make for effective teaching of mathematics. These factors appear in evidence about school effectiveness in general, and effective teaching of mathematics in particular, and have been enshrined in the TTA's national standards for headteachers. The key factors are:

- headteachers with appropriate knowledge and understanding, skills and attributes to secure effective teaching of mathematics in their school;
- high expectations of staff and pupils;
- a climate that secures effective teaching by teachers, and successful learning and achievement by all pupils;
- a whole school approach to the professional development of teachers, including the mathematics co-ordinator and newly qualified teachers, with an emphasis on teaching methods and relevant subject knowledge;
- maximum involvement of the deputy head and other teachers in improving the quality of education provided;
- systematic monitoring - including self review - under the headteacher's direction, of teachers' planning, teaching and assessment of numeracy;
- a thoroughly planned teaching programme, or "scheme of work", to ensure consistent approaches and good progression;
- carefully planned and regular use of homework;
- clear targets for numeracy, with a realistic plan for achieving them and regular evaluation of progress towards them - including effective arrangements, taking account of national standards, for assessing the standards attained and the progress over time by year groups and individual pupils;
- active involvement of governors in policy, monitoring and evaluation; and
- productive links with parents and the local community.

24 An effective subject co-ordinator is also important in ensuring that mathematics is taught successfully. The co-ordinator needs appropriate training and development to fill this role. The characteristics of an effective co-ordinator relate both to mathematics specifically and to their general leadership role, and include:

- the expertise and opportunity to influence classroom practice, i.e. enough non-contact time to teach demonstration lessons, to help colleagues to plan, to teach in partnership, and to observe and give feedback to colleagues;

- a secure knowledge of mathematics, including the statutory curriculum and assessment requirements, what makes for high quality teaching in the subject, the relationship of mathematics to the curriculum as a whole, how information and communication technologies (ICT) can be used to aid teaching and learning of mathematics, and the implications of the Code of Practice for Special Educational Needs for the teaching and learning of mathematics; and

- the leadership skills to work positively with colleagues, acknowledging their contribution and experience, and encouraging commitment to high standards of mathematics.

25 The positive involvement of parents with the school is also important, and is discussed in more detail in the next chapter.

Desired outcomes

- Headteachers and governors are clear about their role and responsibilities in improving standards of mathematics in their school, and have the knowledge and opportunity to fulfil them effectively.

- Mathematics co-ordinators have clearly defined roles in relation to the improvement of mathematics, are clear about their role and responsibilities and have the knowledge and opportunity to fulfil them effectively.

The importance of "opportunity to learn"

26 TIMSS data show that English pupils do relatively well in some aspects of mathematics but not in others. The results indicate, for example, that primary pupils have tended to do relatively well at geometry but relatively poorly at number and fractions and proportionality. Teachers tend to teach different topics in mathematics in the same way. Teaching approaches and classroom organisation are clearly significant, but so, also, is pupils' "opportunity to learn". This includes factors such as the content of the mathematics curriculum and its expectations, teachers' depth of knowledge about all aspects of that curriculum, and the allocation of time to mathematics and different areas within it.

The mathematics curriculum

27 The present National Curriculum for primary mathematics in England includes Using and Applying Mathematics, Number, and Shape, Space and Measures. Handling Data is introduced as a separate section at Key Stage 2. There is a considerable emphasis on number in National Curriculum tests. Over three-quarters of the marks at Key Stage 1 and about two-thirds of the marks at Key Stage 2 address this aspect of mathematics. Moreover, many of the marks for Handling Data at Key Stage 2 are also for tasks relating to tables and diagrams involving numbers. For 1998, a statutory mental arithmetic test has been added at Key Stages 2 and 3, thus further emphasising the importance of number and, in particular, mental calculation skills. A mental test is also included in the optional tests for 9 year olds.

28 A comparative study shows that national guidelines on the mathematics curriculum in countries currently doing better than England in international comparisons of numeracy tend to have strong expectations in terms of developing pupils' oral and mental work.[4] Formal written methods are introduced after pupils are competent in mental calculation involving two digit numbers and the "four rules" of addition, subtraction, multiplication and division. In the Hungarian syllabus, for example, pupils work mentally with two digit numbers until the end of what would be Year 3 in England, and there are no attempts to teach standard written methods of calculation until work with three digit numbers starts in Year 4. During Year 5, all mainstream pupils are expected to do a range of demanding work. Primary school textbooks in Switzerland give mental arithmetic preference over formal pencil and paper methods until the age of 9.[5] These foundations appear to result in more rapid progress, even though many pupils start formal schooling later than in England. Pupils seem to be more confident at manipulating whole and part numbers and can begin to acquire a firm basic understanding of algebra before they are 11 years old.

29 The curricula of these countries place more emphasis on number and on fluency in calculation, which form up to 80% of pupils' learning. They emphasise geometry and data handling correspondingly less, although these aspects of mathematics are not necessarily ignored. The English curriculum has been more concerned with teaching a wider range of knowledge at an early stage than the curricula of other countries, which seek to secure fluency in number before introducing other topics.

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[4] D. Reynolds and S. Farrell, *Worlds Apart?* (OFSTED, 1996),

[5] H. Bierhoff, *A comparison of primary school textbooks in Britain, Germany and Switzerland* (National Institute of Economic and Social Research, January 1996)

Teachers' knowledge of the curriculum

30 In order to ensure that pupils achieve high standards in mathematics, teachers need a deep and interconnected knowledge of the subject, relevant to the primary curriculum and pupils' later development. Teachers need to understand what they are teaching before they can begin to consider how to pass on knowledge of the subject to their pupils.

31 Teachers who have a good knowledge of the curriculum requirements also need to be able to ensure that this knowledge is applied effectively in their day to day teaching, through which children experience the curriculum. This country's National Curriculum requirements are expressed succinctly, leaving teachers a fair degree of freedom about the depth to which topics should be taken, and the balance between them. Some teachers use this freedom constructively. Others turn, sometimes uncritically, to published schemes to fill this gap, because of their own uncertainties about the subject and how best to teach it to children. The popularity of QCA's exemplification material, and of the National Numeracy Project's Framework for Numeracy suggests that many teachers would prefer to have greater guidance about what they should be doing in the classroom. Telephone requests for the Framework for Numeracy, for example, run at around 100 per day. QCA is currently developing a publication to respond to a need for more directed guidance on developing pupils' mental calculation strategies.

Teaching time

32 Sir Ron Dearing's 1993 report on the National Curriculum and its assessment included the recommendation that mathematics be taught in about 3.5 hours per week in primary schools, and about 2.5 hours per week at Key Stage 3. This represents about 16.5% of the teaching time at Key Stage 1 and 15% at Key Stage 2. Inspection evidence and TIMSS findings suggest that many schools devote more time to mathematics than this recommended minimum - an average of about 4.5 hours per week, or 19% of teaching time, but this disguises a wide variation. OFSTED evidence suggests that 90% of primary schools spend between 3.75 hours and 6.25 hours per week teaching mathematics. It is difficult to be wholly confident about the accuracy of these figures, however, because of the way in which many primary school timetables operate. Where schools operate integrated days and topic work, the time pupils can spend on mathematics varies considerably from class to class and pupil to pupil. All this suggests that the problem is less one of overall time spent, but of ensuring consistency between and within schools, and of ensuring that every pupil has access to regular, sustained teaching of mathematics.

33 The experience of the National Numeracy Project suggests that a daily mathematics lesson of about 45 to 60 minutes, ideally timetabled in the morning, is about right for primary pupils, including those with special educational needs. The lesson generally proceeds at a brisk pace, whilst allowing some time for pupils to reflect on what they have learnt, with objectives clearly stated at the beginning and key points summed up at the end. Beyond the daily lessons, a little extra time - about 15 minutes per class each week - is needed to talk with individual pupils about their progress.

34 Good quality mathematics teaching does not, of course, depend solely on the amount of time devoted to the subject in the timetable, however regular. Children's active learning time in any given mathematics lesson depends crucially on the effectiveness of the teaching methods and classroom management used by the teacher, as discussed below. Homework, too, increases the learning time available to the child, and it is important that teachers set good quality homework that uses this opportunity. Homework is also a way to involve parents in their children's learning of numeracy, and is discussed more fully in the next chapter.

Desired outcomes

- A greater emphasis is given in the curriculum to oral and mental work to secure the foundations of numeracy, before formal written methods are introduced.
- Teachers have a secure subject knowledge of mathematics that is relevant to the primary curriculum and to pupils' later development.
- Primary schools give defined teaching time to mathematics, with daily lessons, a high proportion of which are devoted to numeracy.
- Primary schools extend learning time through out of class activities and homework.

Teaching methods and classroom organisation

Giving children access to the mathematics curriculum

35 Research and inspection evidence suggest that effective learning of mathematics occurs when there are well established links between different parts of a lesson, and between and across topics within the mathematics

curriculum. New knowledge needs to be linked to what has already been learnt and understood, whether in the same lesson, or earlier. Using a variety of activities on a particular topic helps to consolidate and extend pupils' understanding of it. Pupils need regular opportunities to access and use the knowledge they already have, including showing instant recall of as many number facts as possible.

36 When pupils acquire calculation skills, they can often use them well at first, but then lose them quickly. Mental work plays a key part in keeping these skills sharp and well honed over time. When pupils know key number facts by heart, "knowing by heart" and "figuring out" can support each other, as new facts can be worked out from those that pupils already know. Pupils' overall understanding is helped by an emphasis on clear, accurate work, understanding how clear presentation can support logical thinking, the development of mathematical vocabulary and the use of correct notation. OFSTED's findings about the importance of mental work are reflected in the National Numeracy Project, the national curriculum for initial teacher training and the needs assessment materials developed by the TTA for Key Stage 2 teachers. They are also implicit in QCA's forthcoming guidance on mental calculation strategies.

37 Mathematical concepts are abstract, and children can find them difficult to grasp. Effective teachers often first illustrate these concepts in a context that makes sense to their pupils, carefully choosing demonstrations and explanations that draw out the underlying mathematical concept. Teachers can use basic classroom resources to model methods and ideas, e.g. a number line can be used to show that subtraction "undoes" addition, or number squares can be used to show how knowledge of how to add up units can be used to "figure out" new facts. Teachers can also illustrate concepts through a real life context, perhaps based on a game or puzzle, perhaps making use of measurements or data the children have collected in another school subject or from everyday life, e.g. "How many packets of Spice Girls crisps at 39p each can you get for £5?", when working on division.

38 Pupils are also expected to use and apply their mathematical knowledge and skills in other subjects, which means that a poor grasp of numeracy can affect their progress in these too. Like literacy, therefore, numeracy is an important tool for gaining access to the whole curriculum. Mathematical skills are sometimes taught in the context of another subject, and once pupils have secure numeracy skills, other subjects can provide an opportunity to consolidate, practise and extend what they have learnt in mathematics lessons. Such opportunities are important, but are often not sufficiently defined or exploited by primary schools.

The importance of effective interaction

39 Some forms of classroom organisation are more effective than others for teaching mathematics successfully. Successful teaching and learning does not, however, depend solely on the form of organisation. The quality of interaction that happens within the classroom - good communication between teacher and pupils - is of prime importance. Good whole class teaching is an effective and efficient way of maximising the amount of interaction between the teacher and all the pupils. It enables the teacher to demonstrate and explain, to discuss the work, to question pupils and respond to them, and to judge who understands and who does not.

40 Evidence from TIMSS and from OFSTED inspections shows that English children still spend a considerable amount of lesson time working individually from published materials. OFSTED's *Key Stage 1 and 2 Subject and Standards Review 1994/95* identified that teachers usually deploy a very narrow range of teaching styles with a class, a major reason for this being that they rely too heavily on published schemes, which pupils work through individually. Pupils have some assistance from the teacher on a one to one basis, but are fundamentally left to "teach" themselves. An effective teacher of mathematics conveys information to children personally, rather than relying too much on curriculum material or textbooks. Although individual practice is important, leaving children to do too much practice on their own gives little opportunity for interaction between the pupils and their teacher.

Whole class teaching

41 Inspection evidence and the experience of the National Numeracy Project point to an association between more successful teaching of numeracy and a higher proportion of whole class teaching. There is support for this in the research literature, which also identifies the quality of the teaching as the key factor.

42 Teaching the whole class does not mean that the teacher simply "lectures" the class. Good direct teaching with the whole class is characterised by genuine communication about mathematics. Teachers give pupils the opportunity not only to show what they know, but to explain the reasons behind it, and suggest creative ways of tackling new problems. This gives teachers important feedback about where pupils may be uncertain, and where they are not making connections between old and new knowledge. Some of the countries that do best in international comparisons, such as Japan and Korea, report a high frequency of lessons in which children work together as a class, and respond to one another. The proportion of lessons of this sort in England is much lower.

43 There is also evidence that the level and type of teachers' questions is important. Teachers need to be sensitive to pupils' different levels of attainment when targeting individuals, and may need to give pupils time to think, or to discuss their answers in pairs, before answering. There is positive benefit from asking questions that challenge pupils to think about the mathematics before giving an answer. Such "open" questions invite pupils to explain their reasoning, for instance by making new connections in their knowledge, or in the ways in which existing knowledge can be used to solve mathematical problems or problems in a real life context. Closed questions, which demand a single correct answer, are useful for practising recall of multiplication tables or steps in a procedure, but if these are the only sort of questions asked, whole class teaching is unlikely to realise its real potential.

Group work

44 Group work is a way of increasing interaction with a teacher further. The teacher may teach each group for a period, whilst other groups get on with other work, with pupils helping each other when they have problems. Working in a group, with or without the teacher, encourages pupils to communicate amongst themselves, forcing them to justify to each other their own approach to a problem.

45 One purpose of group work is to allow a manageable degree of differentiation around a common theme. Groups can be organised by attainment, and while the main body of the class works on the set task, a more challenging task can be set to challenge the most able, with a simplified task for those who would benefit from this.

46 Another purpose of group work is to encourage pupils to collaborate in solving a problem. This needs careful handling if a few children are not to dominate, but research suggests that it gives particularly good results where groups are mixed in attainment. In every case, it is important that the activity is clearly planned, and that communication between pupils is about mathematics.

Paired work

47 Working in pairs on appropriate tasks, e.g. number games, guessing the rule that the other pupil is thinking of, can produce a high level of involvement, thinking and communication. This kind of activity is often most effective after a similar activity has been carried out with the whole class, to ensure that all pupils understand what to do.

Individual work

48 It is important that pupils have some opportunities to work individually, either to practise a method, or to apply to different contexts something they have partly learned, in order to consolidate the ideas and methods. Pupils also need experience of sorting out an unfamiliar problem on their own without depending on others. Individual work of this sort may sometimes happen before pupils share their ideas in a group. When pupils have to practise a quick method on their own, it may be appropriate to confine this to a short period with a fast pace. At other times, children will need time to reflect individually on what they are learning, and to tackle more complex questions.

Differentiation

49 Teaching the whole class together for a high proportion of time naturally means that there is only a limited amount of differentiation, although questions to an individual will take account of that pupil's level of attainment. As noted above, differentiated work can be provided when pupils are working on their own work in groups, divided according to attainment. If pupils work together in a group on a particular problem, however, mixing the abilities of the pupils in the group produces the best results. On any occasion when differentiated work is provided for pupils, evidence shows that there should not be too many different levels of differentiation. When a very wide a range of work is going on in the classroom at any one time, the teacher gets too involved in organisation and rapid trouble-shooting with individuals, and has less time to talk with pupils about the mathematics.

The right blend of teaching methods

50 Above all, the teacher must ensure that the teaching method chosen supports the particular learning objectives set. As outlined above, it is clear that some forms of organisation are more effective for particular purposes than others. A solid diet of working individually through mathematics scheme books is not an effective way either of improving mental flexibility, or of learning to communicate orally about mathematical reasoning. On the other hand, a routine of lessons in which the teacher does much of the talking, and asks occasional closed questions, will not develop pupils' independent problem-solving skills. There are many advantages in having a whole class of pupils of different abilities working together, but it will sometimes be appropriate to have groups of pupils working on different tasks, according to what they have already learned, with the teacher able to focus on teaching one particular group of pupils.

51 As an example of a "blend" of methods, the usual structure in the National Numeracy Project is for a teacher to start the lesson with the whole class, often beginning with teaching of recall e.g. number facts and multiplication tables, before moving on to discuss and develop new strategies and ideas. There is often some point during the lesson when pupils move into work in pairs or in groups. Lessons finish with a review with the whole class, when teachers discuss what the important points of the lesson were, and pupils share what they have been doing and what they have learned. Teachers participating in the Project have found this structure both effective and manageable. Whilst they have often preferred to stick rigidly to a set structure when they first embark on using a high proportion of whole class teaching, they have gradually become more confident about choosing for themselves which form of classroom organisation to use at a particular time.

Desired outcomes

- All children have the opportunity to take part regularly in oral and mental work that develops their calculation strategies and recall skills.
- Teachers know how to illustrate, demonstrate and explain mathematical concepts, offering models and contexts from which the key ideas can be extracted.
- Teachers establish appropriate links between different topics in mathematics, and between mathematics and other subjects.
- More time in mathematics lessons is devoted to interaction between teachers and pupils about mathematics, especially in interactions with the whole class, and also in groups.
- Less time in mathematics lessons is spent working and trouble-shooting with individuals, and in using questions that do not challenge pupils to think.
- Teachers are knowledgeable about the forms of classroom organisation that are most effective in improving standards of numeracy, and know when it is appropriate to use each particular form.
- Teachers provide appropriately demanding work for pupils, with limited differentiation around work common to all pupils in one class.

Classrooms that are resourced for learning

52 A variety of resources can be used to support the teaching and learning of mathematics. Simply having the resources in the classroom will not in itself ensure that effective teaching and learning happens. The classroom needs to be organised in a way that will maximise their benefit. For example, seating should be arranged so that all children can see the board being used for demonstrations and explanations, and move to and from it easily, and a number line and 100 square should be placed where children can see and touch them. Storage also needs to be properly organised, so that valuable lesson time is not wasted looking for items of equipment.

53 There are several basic teaching resources that have been found to help children master numeracy skills effectively. They are particularly useful for allowing pupils to demonstrate what they have learned to do mentally before moving on to formal written work. The Task Force believes that every school should be equipped with these inexpensive resources - many have them already. The key resources for each classroom are a board, a large sized number line, and a 100 square. Resources for individual pupils are smaller number lines, counters, dice, dominoes, plastic coins and sets of number cards to hold up when quick responses are required in mental work. Schools also need sufficient workbooks and/or textbooks in every class for pupils to use for practice.

Desired outcome

- All teachers have access to key resources for the classroom and individual pupils, and use them effectively to teach mathematics.

Information and Communication Technologies (ICT)

ICT for enhancing pupils' learning

54 The benefits of using ICT to enhance teaching and learning in mathematics are well established in the UK. Programs to "teach" a particular number skill have been used successfully for practice and reinforcement with young children at home and school. Databases, both those assembled by pupils and those already prepared, can be used to sort and present information in a variety of ways. Older pupils can be taught to use a spreadsheet to learn more about formulae. They can also learn about the properties of numbers and shapes through writing and amending short programs. Where pupils have access to a computer

at home, or in lunchtime or after school clubs, software packages can be used to good effect to keep particular topics 'simmering', reinforcing and practising skills in an enjoyable context. They can be particularly useful for giving extra practice to individual pupils who have fallen behind and need to catch up.

55 There are still difficulties to be overcome, however, before the benefits of ICT can be realised to the full in mathematics lessons. As the technology has developed, so the potential opportunities have increased, requiring the design of increasingly sophisticated software packages to exploit the technology. The DfEE has recently conducted a review of the range and quality of educational software available to schools and will be publishing its findings shortly. These should help to inform the dialogue between the DfEE, the educational ICT supply industry and others, with the aim of ensuring that relevant, high quality materials are available to teachers. The potential of new technology also depends on each teacher's competence and confidence in using ICT as a resource for teaching and learning, and the ITT national curriculum for primary mathematics includes this element for all trainees.

56 One example of sophisticated software is an integrated learning system (ILS), which usually features a curriculum module, a pupil performance recording module and a management module. There is a range of systems available, some depending on interaction between the teacher and pupil, and others that allow the pupil to be independent of the teacher in moving up and down the curriculum pathway. Over the past three years, the DfEE has funded an evaluation of different types of ILS to see what potential they may have to support the development of children's literacy and numeracy skills. ILS systems are very costly, and the evaluation has therefore also been looking at whether they provide value for money. The National Council for Educational Technology has published two reports covering each of the first two phases of the research. The DfEE will be publishing a report covering the overall evaluation early in 1998, which will be of interest to the Task Force as it takes forward its work.

57 The Hamilton Maths Project has been examining the use of ILS that gives pupils individualised, guided practice in arithmetical techniques. The Snapshot software, being developed by the same project, gives detailed diagnostic feedback to teachers on their pupils' progress, linked directly to the levels of the National Curriculum and key number topics.

Calculators

58 The Task Force's commitment, in the light of the research and inspection evidence, to the importance of mental calculation, inevitably has implications for a judicious use of calculators to support the teaching and learning of numeracy. DfEE Ministers have recently asked QCA to develop guidance for teachers on the use of mental calculation methods at Key Stages 1 and 2, discouraging as far as possible the use of calculators at those key stages. The Numeracy Task Force has been asked to work with QCA in developing that guidance, which will be available in the early part of 1998. In taking forward this work, we and QCA will take into account any relevant views expressed on the use of calculators during the consultation on this preliminary report.

The National Grid for Learning

59 The DfEE's development of the National Grid for Learning will give teachers access to online teaching and learning materials, and a database of best practice. Consultation on the National Grid ended in December 1997, and the prototype will be launched in early 1998. The Task Force believes that the Grid offers potential to enhance the teaching and learning of numeracy in schools, and to contribute to the continual updating of teachers' skills, but that good quality training to allow teachers to use it well will be essential. Training in the use of ICT will be provided through Lottery funding, which will begin from 1999. We consider it important that the government's major investment in ICT be used to reinforce the objectives of the National Numeracy Strategy.

60 The potential of the Internet is already being explored in various ways. The NRICH web site set up by the University of Cambridge offers a valuable bank of intriguing mathematical puzzles and problems for pupils of all ages, with a special section designed for primary pupils. This is especially useful for stretching very able children.

Desired outcomes

- Teachers are well-informed about ICT that can enhance the teaching and learning of mathematics, and are confident and competent in using it.
- The National Grid for Learning provides an up to date, accessible and stimulating source of ideas for the classroom and information about good practice for teachers.

Assessment

61 A review of international research[6] suggests that the judicious use of classroom-based assessment to inform teaching can raise standards significantly, making a difference in schools that is large enough to close the gap in mathematical attainment between, say, Britain and Japan. This effect has also been found in a recent study of primary mathematics teachers in England.[7] OFSTED inspection evidence has drawn attention to the improvements good assessment procedures can make to standards, but noted that the use of assessment is inconsistent, and that teachers find it difficult, particularly when the school's scheme of work does not clearly identify the progression in knowledge and skills expected of pupils.

62 Statutory Baseline Assessment of all children starting primary school will be introduced from September 1998. Children will be assessed against aspects of QCA's *Desirable Outcomes for Children's Learning on Entering Compulsory Education,* including mathematics. All schemes for baseline assessment will be accredited by QCA. The results of baseline assessments will provide valuable information that will help teachers to plan work for children's learning needs. Suitably structured assessment against aspects of the desirable outcomes for mathematics should enable Reception and Year 1 teachers to establish realistic and high expectations of what young children are able to achieve when they start compulsory schooling.

63 It is important that Early Years and Key Stage 1 teachers use appropriate and flexible teaching and assessment strategies to help young children become positive and enthusiastic about mathematics. Children will then be more likely to achieve successes in their learning. Inappropriate curriculum and assessment strategies result in early failure and negative attitudes that are difficult to overcome later. Young children need opportunities to participate in practical activities, use mathematical language and to develop mental strategies, without undue pressure of formal recording of methods and solutions.

64 To support teaching and learning of pupils of all ages, effective teachers collect information about the strengths and weaknesses each pupil has acquired in relation to what has been taught. This information is gained in a variety of ways, including for example:

- scores on regular mental tests;
- recall, reasoning and the clarity of explanations given in oral and written responses, in whole class, group and individual discussions;

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[6] P. Black and D. William, 'Assessment and classroom learning', in *Assessment in Education 5.1* (1997)
[7] M. Askew, M. Brown, D. Johnson, V. Rhodes and D. William, *Effective Teachers of Numeracy* (King's College, London, 1997).

- scores on tests given before and after a new topic is introduced, to see what is known beforehand, and then to check on progress;

- use of National Curriculum tests and the optional QCA Year 4 tests to track progress and identify areas for attention;

- performance in more extended investigation and problem-solving tasks, to see what knowledge children are able to use and apply, and what problem-solving and reasoning skills they have acquired; and

- the success of each pupil in meeting their own personal targets, which should be realistic but challenging, and set in discussion with the teacher.

65 Teachers need to be clear themselves about the nature of, and progression in, the ideas and skills they are trying to teach in a particular lesson or group of lessons. The type of feedback given to pupils is also important. Giving praise can improve attitudes, but over-use of praise can diminish its effect, and lead pupils to become uncritical of their own work. Giving verbal comments on how work can be improved is much more effective in raising attainment than giving either grades or praise.

66 The information teachers get from assessment helps them to diagnose pupils' strengths and weaknesses, which informs the planning of activities. Assessment at the start of a topic is therefore probably even more important than testing at the end of the teaching. Teachers can, of course, gather useful information about pupils through informal oral questioning in the classroom.

67 Deciding with other teachers how to gather assessment information, and then analysing it, is an important part of professional development. Many teachers have found it particularly useful to have sessions in which they share and discuss pupils' work in a particular topic area, both within and across year groups, in order to assess what learning has taken place and what still needs to be done. The exemplifications of pupils' work produced by QCA in annual standards reports have helped schools to compare the standard of their pupils' work with the standards expected nationally.

68 Systems for recording assessment information should meet the planning and reporting needs of teachers, and be easily understood by others, but should not take up a disproportionate amount of time. Where most pupils in a class meet the targets set, a class record can be enough, with more detailed notes kept on those children who differ markedly from this standard.

Desired outcomes

- Teachers are clear about the learning objectives and progression in relation to pupils' knowledge, skills and understanding in mathematics, and can share this information with pupils and parents.

- School assessment procedures help teachers to gather assessment information, to analyse it to diagnose pupils' strengths and weaknesses, and to identify the standards attained.

- Curriculum planning builds on information obtained from classroom assessment by a variety of methods, including regular mental tests and oral questioning, with assessment at the start and end of a new topic and at random times during the year.

- Pupils are involved in setting their own targets and in self-assessment, and receive feedback through comments about both the strengths and weaknesses in their work.

- Recording systems give teachers the information they need to plan and report successfully, but are not too time-consuming to maintain.

The ratio of adults to pupils

69 Most primary schools employ one or more general classroom assistants, particularly for Key Stage 1 classes, and parents sometimes give voluntary help. HMCI's annual report in 1995/96 noted that classroom assistants made strong contributions to work in the classroom, and that specialist teacher assistants were also beginning to make valuable contributions to teaching the basic skills in numeracy. Nearly 90% of primary schools provide some kind of learning support for pupils with learning difficulties, and in some parts of the country, support is also provided for pupils for whom English is an additional language. Thus, the number of adults in primary classrooms - and inevitably, the effectiveness of the balance between their input and the teacher's input - varies greatly.

70 One study found that pupils in its sample had more learning time when the teacher had one adult assisting, but that more than one extra adult could be counter-productive.[8] This was largely because more and more adults in the room meant that pupils were surrounded by more and more distracting tasks

[8] R. Alexander, *Versions of Primary Education* (Routledge, 1995)

and activities. The study found that agreement about curriculum content and teaching methods between teachers and those assisting them could not always be taken for granted. The extra adults were more effective when they were regularly involved in planning lessons, well briefed about their role, and worked with the class teacher rather than withdrawing groups or individuals.

71 This suggests that additional adults can play a range of roles in mathematics teaching, depending on how the class is organised at the time. During group work, when the teacher is with one group, part of the assistant's role is to assist with the rest of the class, ensuring that children interpret instructions correctly, and maintain concentration. Assistants can also be trained to explain and question in ways that will help to support children's understanding, and to use number lines and other resources to illustrate mathematical ideas. In whole class work, they can position themselves near children who need special help, and provide that help discreetly. Above all, to maximise the value of help in the classsroom, the teacher and the adult assisting need to work as a team, from a common understanding about the effective teaching and learning of numeracy. Assistants need training in order to gain the knowledge and skills that will allow them to play this role.

Desired outcome

- Teaching assistants know what children are to learn, what teaching methods and mathematical terminology are involved, and work in partnership with, and are used effectively by, the teachers they are assisting.

Initial Teacher Training (ITT)

72 The key to long term improvement in numeracy is the recruitment and training of future teachers. The minimum mathematical qualification required of the majority of primary school teachers is a Grade C in Mathematics, whereas prospective trainees in many other countries continue with their mathematical training up to age 18. It is important for teachers to have the mathematical confidence that is needed for successful, interactive teaching, to know where mathematics is leading and to know the concepts that are fundamental for later progress. OFSTED evidence indicates that the quality of teaching by mathematics specialists is generally better than that of non-specialists. The best specialist teachers have a more confident command of mathematics, which they use to maintain a brisk pace to lessons and to set high expectations, which are invariably met by pupils. It must, therefore, be desirable to attract specialists in mathematics into primary schools as well as secondary schools through the TTA's recruitment campaign.

73 Whatever their initial level of mathematical qualification, teachers entering the classroom for the first time need to have sufficient knowledge and skills to teach numeracy well to primary pupils. All teachers need to share a common understanding of the most effective ways of teaching mathematics. It is particularly important for teachers to be able to engage in successful interactive teaching, which will allow them to recognise, and help to correct, pupils' misconceptions and errors. Together, the new Standards for Qualified Teacher Status and the new ITT national curriculum for primary mathematics set out the range of subject knowledge and teaching skills that all trainees need to teach mathematics effectively. It will be important for the TTA to ensure that sufficient primary mathematics specialists are trained under the new requirement that every primary trainee must be trained to teach at least one specialist subject. Each training provider must currently decide how best to assess whether trainees' subject knowledge meets the new required standard, and TTA and OFSTED will be monitoring the effectiveness of these arrangements as they are implemented. The Task Force recognises that the ITT requirements in relation to subject knowledge and teaching skills are high, and welcomes this. We are concerned, however, that all those providing ITT in schools and higher education should be fully prepared to meet those requirements.

74 It is important that trainees have sufficient opportunities to observe and discuss good quality teaching of mathematics. These opportunities are already required by the criteria for primary ITT, but they should be maximised over time as a National Numeracy Strategy takes effect. They should include the opportunity to analyse the teaching of numeracy with fellow trainees, the teacher and/or tutor afterwards.

Desired outcomes

- Newly qualified primary teachers are equipped with secure mathematical subject knowledge and teaching skills.
- Trainee teachers have opportunities to observe good practice in mathematics teaching

Numeracy in secondary schools

75 No strategy for improving numeracy at primary level will ever be really successful unless this is followed through into secondary school, and ultimately, into the world of work. It is important that secondary schools, as well as primary schools, take opportunities to enhance the teaching of numeracy within mathematics. A good understanding of numeracy not only leads to the

higher levels of mathematics at school, but is also highly relevant to the needs of further and higher education and future employers.

76 In contrast to the Key Stage 2 results, the percentage of 14 year old pupils achieving the standard expected for their age in National Curriculum mathematics tests (between Levels 5 and 6) has remained relatively static over the last 3 years. In 1995, 57% of pupils achieved at least Level 5. The percentages in 1996 and 1997 were 56% and 59% respectively. It is important that mathematics teachers in secondary schools know about the National Numeracy Strategy. They must be ready to capitalise on the gains made by pupils entering their schools as it is implemented, with closer consultation and collaboration between secondary mathematics teachers and their colleagues in feeder primary schools. There is scope at present for secondary schools to develop their own numeracy courses to develop pupils' mental skills and general facility with number. As the National Numeracy Strategy takes effect, however, there must be potential to build further, in Key Stage 3, on effective practices established at Key Stages 1 and 2. This could begin with a small scale project focusing on teaching practices in secondary schools to identify how the successful practices at primary level could best be used to allow secondary schools to capitalise on the strategy.

77 Maintaining continuity of progress and achievement through the transition from primary to secondary schools in years 6 and 7 is a problem area, exacerbated by the rise in the number of primary schools feeding many secondary schools because of open enrolment. This transition problem was demonstrated most recently in the findings of the joint QCA and NFER evaluation of the 1997 summer literacy schools pilot project, run by the DfEE with Education Extra. Nonetheless, the evaluation found that the summer schools were remarkably successful in improving pupils' attitudes to, and confidence in, reading, and in strengthening links between primary and secondary schools and between home and school - all aspects that would ensure sustained progress over time. It is worth exploring whether a similar scheme, perhaps focused at the end of the summer holiday rather than the beginning, taking into account the lessons learnt in the literacy pilot, and suitably adapted to numeracy, could generate even more positive gains in mathematics.

78 More generally, a close working relationship is needed to make the transition between schools successful. Secondary teachers should understand and appreciate what has been achieved in mathematics in primary schools, and how specific difficulties with mathematics have been tackled. Primary teachers, particularly those teaching year 6, should understand and appreciate what comes in Year 7 onwards. In particular, they should understand the key

concepts that pupils will encounter, for example in algebra, in the early years of secondary school. Schools also need sufficient information about pupils' achievement in primary school, and should use this to continue to improve standards. The information secondary schools receive at the moment is not detailed enough to allow them to build on what a pupil does and does not know. QCA is currently consulting on transfer issues, and is asking, as part of this consultation, whether age standardised scores in mental arithmetic and mathematics should be included in the assessment information given to a pupil's receiving school. ICT can be useful in facilitating the transfer of information, and schools should exploit it fully for this purpose.

Desired outcomes

- Successful transition from primary to secondary schools, in which pupils' achievement in mathematics at Key Stage 2 is built upon, and developed throughout secondary school.

- Secondary pupils have numeracy skills relevant to the world of work, and attractive to employers, and are well prepared to use higher mathematical skills in further study.

3 Support of parents and the community

79 Numeracy matters to both children and adults. Most jobs require basic numeracy skills, such as the ability to estimate, and even young children need to be able to tell the time or count their change when buying things. Parents as well as teachers can play a positive part in helping children to develop these skills, and the help of parents is needed for reaching the numeracy target in 2002. The Task Force believes strongly, as noted at the very beginning of this report, that a positive attitude to numeracy amongst parents and the community is essential for a National Numeracy Strategy to succeed.

80 This chapter discusses measures that could be taken to:

- promote a more positive attitude to numeracy amongst parents and other adults; and
- increase parents' involvement in their children's learning of numeracy.

81 These objectives are distinct, but related in that a key factor influencing both appears to be a general lack of confidence amongst adults about their own ability in numeracy. Parents may sometimes be reluctant to help children with numeracy for fear of "getting it wrong". Generally, adults are more positive about their ability to read than their ability with numbers. It is usually more difficult to persuade people that mathematical activities are enjoyable than it is to promote reading as an activity that families and the community at large can share.

How the community can help

Raising the profile of numeracy

82 Developments to support parents and children alike need to take place in a wider climate of support for numeracy. Mathematics needs to be seen as a worthwhile activity that is enjoyable in its own right. The National Year of Reading planned for the school year 1998/99 aims to involve the whole of society - including parents and grandparents, schools and employers, libraries and booksellers, local authorities and LEAs - in a national effort to raise literacy standards. There will certainly be some useful lessons to be learnt from that experience. The Task Force has given some consideration to the possibility of a similar initiative to promote numeracy. It should be possible to raise the profile

of numeracy given imagination, enthusiasm and commitment on the part of the organisers. A UNESCO-sponsored World Mathematical Year is already planned for 2000 by the International Mathematical Union. Adding a dimension to address society's attitude to numeracy and promoting children's numeracy skills would provide an excellent opportunity for partnership between a wide range of bodies.

83 The Task Force has had the following initial ideas for activities worth pursuing, and would welcome further suggestions:

- using the media to arouse interest in, and knowledge of, mathematics amongst parents, children and the wider community, including special programmes made to interest primary age children in mathematics using popular cartoon characters and TV presenters, information for parents about mathematics in schools and how they can help their children, stories about how businesses and other parts of the community have supported schools in improving standards of numeracy, and programmes about mathematicians, intriguing or unusual mathematical problems and on those who use mathematics at work;

- encouraging businesses and others to include material about numeracy in their targeted mailings to families, and to offer sponsorship for specific activities, from free mathematical puzzles in cereal packets to major sponsorship of educational software for home and school use, to activity packs for parents distributed through supermarkets, doctors' surgeries etc.;

- encouraging publishers and booksellers to use their contacts with schools, parents and the wider community to promote interest in numeracy; and

- exploiting the opportunities of the Internet by extending current websites and setting up a well-publicised new website about the teaching of numeracy, encouraging contributions on good practice from teachers around the world, making facilities available in libraries and Internet cafés, and using school computers for parents' and children's clubs.

The relevance of mathematics

84 As mentioned at the beginning of this report, the mathematics taught in primary schools lays the foundations for skills that are vital for mathematics in secondary school and for adulthood. It thus opens the door to higher education, and to careers in many areas, including engineering, computing, science, business, finance and economics. Indeed, the vast majority of

mathematics graduates take up careers in finance, commerce and industry.[9] Any effort to secure the support of the community at large for numeracy should also publicise the benefits and relevance of mathematical skills as a route to a wide range of careers. Both the Open University and Leeds University have already produced videos for prospective mathematics undergraduates exploring this theme.

Desired outcomes

- A clear change in cultural attitudes to mathematics from 1999/2000, that helps teachers and parents in their efforts to improve children's standards of numeracy.

- An appreciation among young people, their parents and teachers of the benefits and relevance of mathematics qualifications for a wide range of careers.

How parents can help

85 Parents already help their children in all sorts of ways, which they may not think of as "numeracy", e.g. "How much should we buy?", "When do we need to go out?", "How much is the bus fare?". They also do so when they play games and watch television programmes with their children that involve numbers, and talk about these things as they do them.

Homework

86 Regular homework can give parents the opportunity to play an active part in helping their children to become numerate. This does not mean that they take the place of the teacher in teaching the child about number, but rather, that children are given enjoyable activities to reinforce and practise what they have learnt in class, in which their parents can also participate. School guidelines that build on what parents already do with their children help to maximise the effectiveness of this kind of homework. Such material is already being used in the National Numeracy Project and the Hamilton Maths Project, and a leaflet with ideas for parents of 3 to 5 year olds, *Count and Figure it Out Together,* has recently been produced by the Basic Skills Agency and sent to all LEAs, with an enthusiastic response. This and other good practice should be built upon. But homework needs to be part of a wider bid to involve parents in their children's

[9] Source: *Universities Statistical Record.*

learning. For younger children in particular, it is the involvement of parents, rather than the homework itself, that has the beneficial effect. There is evidence to suggest that the children who would most benefit from homework do not have the support from parents to help them to do it.

87 Homework is an important way of extending children's "opportunity to learn". If time in class is used to maximise the extent of direct interaction with the teacher, then homework opportunities should be used to extend the time spent practising in varied ways what has been learnt, and working on individual activities related to what has been done in class. It can also be a preparation for what is to be done next in class. It is important for children to learn to work independently, but parents also have a key role to play in encouraging children to use homework time effectively. The Task Force will take account of relevant feedback from the government's consultations on the best way to build partnerships between parents and schools through home-school agreements, and on national guidelines on homework.

Improving parents' numeracy skills

88 Parents have an important role to play in their children's development of numeracy skills, but, as already noted, may feel more inhibited about this than reading with their children. An obvious way of building parents' confidence in this area is to offer opportunities for them to improve their own numeracy skills. There was strong support for this in the responses to the White Paper, *Excellence in schools.* Although such opportunities could be offered through adult education classes aimed specifically at the parents of pre-school and primary age children, these might not attract a high take-up.

89 Something that allows parents and children to improve their numeracy skills together is likely to be more productive, such as activities based in schools, but taking place after school hours with crèche facilities. The Basic Skills Agency has recently begun a pilot of family numeracy programmes, building on the successful family literacy approach of offering joint programmes for adults with few qualifications, and their children aged 3 to 6. The literacy programmes showed gains for both parents and children, and although no parents were in education when they entered the programme, 60% of them went on to further study afterwards. The pilot numeracy programmes are in disadvantaged areas, and aim to use games, role playing, and day to day activities to extend understanding of numeracy. The evaluation of the pilot will include assessment of improvement in numeracy skills and the increase of numeracy-related activities at home.

Areas of social disadvantage

90 It is important to promote parental involvement amongst all social groups, but the correlation of numeracy achievement with socio-economic background suggests that it is appropriate to target some specific initiatives at areas of socio-economic disadvantage. This would help to raise parents' expectations of their children and their achievement at school, as well as helping to ensure that these families access more universal initiatives. The government's proposals to establish Education Action Zones (EAZs) are specifically designed to raise educational achievement in areas of social disadvantage, and to engage the wider community in doing so. EAZs should provide a useful mechanism for encouraging innovative approaches to raising numeracy standards that impact on children and parents from such areas.

Desired outcomes

- Pupils have regular, varied homework that enables them to practise what they have learnt in class and encourages input from parents into enjoyable home numeracy activities.
- Parents are secure in their own numeracy skills and enjoy helping their children to become numerate.
- EAZ models have a positive impact on numeracy standards, involving parents and other community partners.

4 Shaping a National Numeracy Strategy

91 This report has so far considered the research and inspection evidence about what works in teaching mathematics, and has set out in the light of that evidence a series of desired outcomes for a National Numeracy Strategy. This process has shown that there are schools and teachers already teaching numeracy successfully, and that it is possible to point to factors that make this happen. The Task Force therefore believes that the core of a National Numeracy Strategy should be a mechanism that spreads these factors from some schools to all schools and from some teachers to all teachers. In considering how best to move from the desired outcomes to recommendations that would achieve them, we thought it important to adhere to the principle stated at the beginning of the report, that fundamental change should not be pursued for change's sake. This chapter therefore looks at the possibilities for building on existing good practice. It also considers how wider social and environmental factors should affect our recommendations, and looks at the particular needs of pupils for whom English is an additional language and those who have special educational needs.

Building on existing good practice

92 The Task Force has found that a number of existing mathematics programmes are already seeking to maximise the factors that the evidence shows lead to effective teaching and learning. Although these programmes come from different influences, we have been struck by the fact that they share a good deal of common ground. Our recommendations therefore seek to build on these programmes, and on the enthusiasm and commitment they have already generated in schools. We were particularly impressed by the National Numeracy Project, because of its proven success in addressing and reducing the considerable underachievement in mathematics in a large number of schools in different areas, and of different types and sizes. We believe that all schools stand to gain from spreading the practices of the National Numeracy Project as widely as possible. The common ground shared between this and the smaller projects mentioned below means that a strategy with these practices at its heart would also provide a sound basis for the schools already doing so to continue to explore variations on this model.

Aims of existing programmes

93 We do not have the space to describe all existing mathematics programmes in detail. Many are funded solely by local education authorities. Some of those also supported by external funding include:

- the National Numeracy Project, involving a sample of schools from 14 LEAs, funded by the DfEE through the Standards Fund (formerly GEST);
- the Barking and Dagenham Project, supported in part by DfEE grant;
- the Hamilton Maths Project, based in Oxford, and supported financially by the Hamilton Trust, an educational charity, and the Government Office for the South East and Heart of England TEC; and
- the Mathematics Enhancement Programme Primary (MEPP), based partly in Newport and Stockton, where it is supported financially by the Gatsby Charitable Trust, and partly in the feeder primary schools to a selected number of secondary schools in the UK, supported financially by Coopers and Lybrand.

94 These projects have all been set up in response to inspection evidence and research on effective teaching of numeracy. Their many common features include:

- an overall aim of raising standards of numeracy in primary schools;
- daily mathematics lessons with a high proportion of oral work;
- a focus on teachers' professional development through training and classroom consultancy;
- practical support and guidance for schools on what to teach to each age group;
- a much greater emphasis on mental calculation than has traditionally been the case, with plenty of consolidation, and a correspondingly later start to pencil and paper calculations set out in a standard way;
- careful attention to the correct use of mathematical terminology and notation;
- a wish to help teachers explain and demonstrate confidently and clearly, question children in skilful ways and involve them actively in lessons;

- an increased proportion of work with the whole class, with group work and some individual tasks where appropriate;

- very little individually differentiated work (other than for some children with statements of special educational needs);

- frequent activities and tasks for pupils to do at home; and

- regular tests to see how pupils are getting on.

95 Apart from their scale and location, there are, of course, some differences between the projects. For example, the National Numeracy Project, the Hamilton Maths Project and the Mathematics Enhancement Project in Newport have taken as their starting point the English National Curriculum. In the National Numeracy Project, schools use the Framework for Numeracy to help them plan lessons and develop a scheme of work. They are promoting in some lessons differentiated tasks at no more than three levels, directly related to the topic being taught. Most pupils have one task, with a challenge for more able pupils and a simplification for those who need it. This is partly needed to cater for the wide range of attainment in many English classrooms, particularly in mixed age classes, to ensure that able pupils are stretched and those who find mathematics difficult have extra time for consolidation. Teachers are being encouraged to make effective use of the good published resources they have and to develop further ideas for teaching based on the best of their lessons. The Hamilton Maths project is also looking at the use of Integrated Learning Systems (ILS) software to support numeracy.

96 In contrast, the Barking and Dagenham Project is basing its approach on the methods and materials used in the Canton of Zurich in Switzerland. Textbooks, teachers' manuals and lesson plans are being translated and supplemented by other materials prepared by a writing team. This project is encouraging minimal differentiation as a way towards reducing low attainment.

97 The relative costs and other details of the projects are as follows:

	Barking and Dagenham	National Numeracy Project	Hamilton Maths Project	Newport and Stockton MEPP	Coopers and Lybrand MEPP
Budget 1997-98	£320,000*	£2,802,000**	£106,000***	£180,000	£50,000*
Date set up	Oct 1996	Sept 1996	Oct 1996	Sept 1997	Jan 1998
Number of schools	30	520	11	14	40
Number of LEAs	1	14	1	2	9
Years covered	Y1 to Y3	R to Y6	R to Y6	R to Y6	Y1
Approx. no. of teachers/ classes	160	5,460	90	120	80
Approx. number of pupils	4,270	151,700	2,520	3,360	2,240
Approx. budget per pupil	£75*	£18**	£42***	£54	£22*

* includes cost of translating textbooks
** includes running costs and salaries of National Centre staff
*** includes hardware and software costs of approximately £29 per pupil

98 Research projects are also being conducted to investigate teaching and learning of mathematics at primary level. One key example is the Leverhulme Numeracy Research Programme, involving King's College London and four LEAs - Croydon, Essex, Lancashire and Wandsworth, with about 5,000 pupils in all. This project aims to gain data about pupils' progression in the learning of numeracy throughout the primary years, and to assess the contribution to their progress of aspects of classroom practice. The project includes two different types of intervention programme, each sharing many of the features listed on the previous page. This research began in September 1997 and will take place over a period of five years.

Results of existing programmes

99 All the projects are being evaluated, although to varying degrees. Because of the timescale, to date only the National Numeracy Project has released some interim findings. These are based partly on standardised numeracy tests taken by three year groups at the start of their time in the Project and at the end of their first year. The test results show statistically significant progress in each of the LEAs taking part, in each of the three year groups, on the mental test, the

written test and overall. Numeracy Project schools also made good progress as judged by the National Curriculum mathematics tests in 1996 and 1997, achieving an overall improvement that was better than the average improvement nationally in both Key Stage 1 and Key Stage 2. In the two other projects that started in October 1996, too, the schools achieved an overall improvement in the Key Stage 1 National Curriculum tests that was better than the national average.

100 The following comments made by pupils and teachers in the Hamilton Maths Project and the National Numeracy Project help to illustrate schools' reactions to these initiatives:

An infant after ten minute session of counting in tens:

"Our class is the best counters in the city."

Seven year old on transfer to a new school from a project school:

"My old school was better because we did quick numbers every morning and I got really good at it".

From another seven year old:

"My teacher does kind of hard sums. Sums is my best subject."

A ten year old, after a lesson on decimals:

"We do real maths now. Our teacher explains things to us, we don't just learn them out of books."

Teachers' comments:

"It's the first time since I started college eight years ago that someone has told me that it's OK to teach the children how to do things."

"The group work is easier to manage. Everyone is doing a version of the same thing. It's quite liberating for me, because I can spend all my time teaching, not just walking around the room checking on their behaviour."

Headteachers' comments:

"It's giving children a vision and making maths acceptable. The children have already achieved more than the teachers thought they would."

"We were a bit sceptical at first but I can now say for certain that it works."

Social and environmental factors

101 The Task Force is concerned that the National Numeracy Strategy should ensure that all children are able to improve their performance in numeracy. This means that we need to be sure that although the strategy will be a national initiative, it will be able to address the particular needs of individual children. This includes children from deprived socio-economic backgrounds, children with special educational needs and children for whom English is an additional language. It also means ensuring that the strategy is equally beneficial for boys and girls, and for children from different ethnic backgrounds.

102 We are encouraged by the findings in OFSTED's report, *The Teaching of Number in Three Inner-urban LEAs* (1997), which looked specifically at teaching in socially disadvantaged areas. The report noted that whilst this disadvantage clearly limited the performance of some schools, others were nonetheless reaching high levels of attainment, with some already achieving the national numeracy target for 2002. The strategies associated with success for children from disadvantaged backgrounds were very similar to those outlined in Chapter 2. Particular factors mentioned in the report included a high proportion of time spent on whole class teaching, with a balance of work in smaller groups, and a good knowledge by the teacher about number, and how to make that knowledge accessible to children. An over-reliance on group or individual work, especially using worksheets and published mathematics schemes, was found to be detrimental to children's progress. QCA's benchmark data, which allows schools to compare their own performance with schools in similar circumstances, is also encouraging. Whatever the socio-economic background of the group of schools, there are some achieving significantly better than other, similar schools.

103 We are aware of the standardised numeracy tests, commissioned by QCA, that have been used to evaluate progress in the National Numeracy Project and the Barking and Dagenham Project. The same tests were used in a survey for the OFSTED report. Analysis of the results of the baseline tests showed a clear correlation between socio-economic background and achievement in numeracy, in that pupils eligible for free school meals tended to achieve lower scores. Pupils from Black African, Asian or Chinese backgrounds, who were fluent in English , tended to achieve higher scores than their white peers with otherwise similar characteristics.

104 We are encouraged by the results obtained in the National Numeracy Project schools. All groups of pupils improved their scores, including higher achievers, both boys and girls (although girls made somewhat less progress than boys), pupils new to English and pupils with special educational needs. Those who started with lower test scores made relatively better progress, so that the gap

between them and other children had begun to close. In the light of all this evidence, the Task Force is confident that its desired outcomes will lead to recommendations that secure improvement for all pupils.

Pupils with particular needs

Pupils new to English

105 Good teachers do not underestimate what pupils new to English can achieve in mathematics simply because their knowledge of the English language stands in their way. An early aim should be to use mathematical vocabulary consistently and accurately in the classroom, so that these pupils learn to say, read and write numbers in English, as well as signs such as plus (+) and minus (-) and words like add and subtract. The text in printed materials may need to be simplified for these pupils, particularly so that their progress is not hampered by the use of contexts with which they are not familiar. The mathematical demands should, however, be the same as for other children.

106 Sometimes staff are appointed specifically to help pupils who are acquiring fluency in English. Where they are assisting in mathematics lessons, it is especially important that their contribution focuses as much on the mathematical objectives of the lesson as it does on children's acquisition of English. Pupils learning English as an additional language improved their test scores significantly in the progress tests in the National Numeracy Project, which, again, suggests that a strategy that promotes the factors identified earlier in the report will also be helpful for these pupils.

Pupils with special educational needs (SEN)

107 Classrooms in this country usually have pupils with a much wider range of abilities than in other European countries, which tend to require pupils to repeat a year if they have not reached a satisfactory level, and also tend to educate a much higher proportion of their pupils in special schools.

108 In this country, an increasing number of pupils with special educational needs are being included in mainstream schools. 2.8% of pupils in England have statements of special educational needs - 56% of these pupils are in mainstream schools. In addition, a further 15% of children within mainstream schools are identified as having special educational needs. The government's recent Green Paper on special educational needs, *Excellence for all children*, proposes the inclusion of more children with special educational needs in mainstream schools,

whilst acknowledging that special schools will remain necessary for some children some of the time. The Green Paper also emphasises the importance of effective early action to ensure that children do not fall behind in the basic skills. Children who need early intervention and support in numeracy can be identified through baseline assessment, for example, followed by regular assessment of progress in the early years of school. We believe that spreading what we have found to be the most effective methods of teaching numeracy to all primary school classrooms will ensure that fewer children will fail to develop sound numeracy skills and go on to develop special educational needs.

109 Where special educational needs have been identified, it is important that the child's individual education plan (IEP) includes suitable objectives for numeracy, that are challenging but realistic. It is common at the moment for IEPs to refer to literacy only. If these numeracy objectives are linked to the school's framework or scheme of work, teachers can bear them in mind when planning lessons. Pupils with statements may to some extent be working on individual programmes based on their statements, but it would also be appropriate for their IEPs to mention numeracy.

110 Schools may need to adapt their teaching methods to some pupils with particular needs. Pupils with physical disabilities may need specialised aids and learning resources to give them full access to the mathematics curriculum, and pupils with moderate learning difficulties may need more time and a greater variety of activities before they are ready to move onto the next step of learning. The school's special educational needs co-ordinator (SENCO) has an obvious role to play in ensuring that the numeracy needs of pupils with learning difficulties or special educational needs are properly catered for, and that they are set appropriate targets. The draft standards for SENCOs currently being prepared by the TTA should help to equip SENCOs to fulfil this role.

111 Numeracy is an entitlement for all pupils, not just those in mainstream schools. We believe that the factors we have identified that are associated with effective teaching and learning of numeracy have much to offer special schools, and hope that as many as possible will be involved in the implementation of the National Numeracy Strategy. Indeed, aspects such as a high proportion of oral work, thorough consolidation of learning, structured lessons, good diagnosis of children's misconceptions, and regular assessment and target setting for all pupils have long been recognised as best practice in special schools. Special schools will need to adapt these methods in some cases. Some pupils, for example, may find the physical and mental effort involved in concentration for, say, 50 minutes of mathematics, too great, and need a much shorter lesson of, say, 30 minutes, with a supplementary time later in the day.

112 In all cases, the close involvement of parents is needed. The Success for All programme in the USA has shown that co-operation with parents and the development of numeracy skills within the family are both especially important for pupils with special educational needs. Our recommendations relating to the role of parents and the community in promoting numeracy are therefore crucial for children with special educational needs.

Co-ordination with the National Literacy Strategy

113 The Task Force is aware that schools will be considering this report in the midst of many pressures and new challenges. In particular, they will be preparing for the implementation of the National Literacy Strategy in 1998/99, beginning with the initial conferences run by LEAs in the summer term 1998. Our aim is to make the National Numeracy Strategy as easy as possible for schools to implement – an important reason for building on existing practices that have been seen to work and to generate enthusiasm in schools. We believe that any training material given to teachers through the National Numeracy Strategy should build, where it is appropriate to do so, on parts of the distance learning material produced for the National Literacy Strategy. It will be important that the DfEE's Literacy and Numeracy Strategy Group ensures that this kind of coherence happens in practice.

114 We are also aware that many primary schools feel concerned about their capacity both to cover the whole curriculum, and to give the necessary attention to numeracy and literacy to bring about the improvements that both Task Forces envisage. We therefore consider it important that the government and QCA bear in mind the demands of the National Numeracy Strategy in conducting the forthcoming review of the National Curriculum.

Encouraging further development in schools

115 Receiving, and acting upon, information about best practice from outside the school is essential if every school is to reach the standard of the best. Once performance is improving, and teachers have embedded this knowledge in their day to day work in the classroom, they are, however, better placed to take independent judgements. Teachers participating in the National Numeracy Project welcomed the lesson structure the Project gave them, but became more

confident in working with the structure over time, and were happier about making judgements about when and how to make transitions between the different phases of the lesson, whilst retaining the overall structure.

116 Once a school is effective, it should be able to develop its own models of best practice, creating a culture in which teachers continually reflect on how they teach. Every teacher can start from the base of the practices that have been shown to work, and continually improve standards of teaching and learning by evaluating the relative gains made by aspects of these approaches. It is part of the professional culture of experienced teachers, who are achieving good results, that they can take creative risks and experiment with new ideas. Some schools are already performing near, or even above, the national target for numeracy and will already be using many of the practices that will feature in the roll-out of the National Numeracy Strategy. They will want to consider how best to develop their good practice further, so that pupils and teachers reach their highest potential.

117 This process of further development of good practice can be enhanced by giving schools indicator systems that will allow them to generate their own professional knowledge. In this context, the national value-added system developed by QCA, and the work in progress on developing value-added measures for school improvement, are both important. Developing performance indicators in numeracy will allow these systems to inform professional development, so that teachers can use the data to improve children's performance by target setting at individual pupil level, as well as at teacher and school level. It will be a statutory requirement from September 1998 that schools set targets in all the core subjects. It is important that this process of target setting, in mathematics and in other subjects, is an integral part of overall school development planning.

An active role for teachers and schools

118 Finally, it is important to note that simply giving knowledge to teachers and schools will not encourage them to act upon it. It is not only important that the knowledge is based on evidence of effective practice. Teachers and schools also need to be actively involved in the process of change, by reviewing, in the light of this knowledge, what they already do, and taking decisions about what needs to change if they are to improve. All schools engage in this process to some extent when teachers decide on their professional development needs. The TTA has developed needs assessment material for Key Stage 2 teachers of mathematics, to help teachers of older primary pupils to look in some detail at the specific knowledge and skills needed to teach mathematics at this level, and

establish what further training they need to fulfil their role successfully. In all cases, in-service training can only be fully effective if the teacher has clear objectives based on an assessment of his or her particular needs, if the training itself matches those needs, and if there is some assessment of the impact of the training in the classroom afterwards.

119 In the context of our strategy, schools also need to play an active role in taking account of the contexts in which they operate, e.g. the socio-economic background and culture from which pupils come, and their existing levels of performance. They need, in particular, to benchmark what they provide for their pupils and what their pupils achieve, against other schools in similar circumstances. Each year from 1998, QCA will publish comparative performance benchmarks to help schools set targets for the core subjects that are both realistic and challenging. These benchmarks are designed to enable schools to compare themselves with similar schools, including those with higher performance, in that in each case, the benchmarks will identify the top 5% level of achievement.

120 Research and inspection evidence shows that there are methods that teachers in all contexts need to use to improve children's achievement in mathematics - these are set out in this report. In order to ensure successful implementation in individual schools, schools also need to take proper account of their current performance and the circumstances in which they work. Further research using the National Numeracy Project and the other innovative current programmes of mathematics development should expand our knowledge of how improvements can best be achieved in different circumstances. Above all, the process of each individual school preparing its action plan for implementing the National Numeracy Strategy will be crucial to the strategy's success. It is at this stage that schools must "audit" the context in which they work, and what they have achieved within it, and decide what action to take.

5 Recommendations

121 The Task Force has set out what works in mathematics teaching, based on evidence from inspection and research. We have stated our intention that the National Numeracy Strategy should spread good practice as widely as possible, building particularly on the National Numeracy Project, which has benefited primary schools of many different types and sizes. In this chapter, we offer recommendations for action. We are interested to hear views on all aspects of the recommendations, but have also listed several questions to which we should particularly welcome a response.

122 We envisage that from the school year 1999/2000, all primary schools will teach a daily mathematics lesson, with a high proportion of these devoted to numeracy. It is vital that this lesson contains high quality direct teaching, often achieved through teaching the whole class together. The National Numeracy Strategy will first ensure that headteachers, governors and mathematics co-ordinators receive training in the management and support of numeracy in schools, then that the co-ordinator and another teacher are trained in methods of teaching mathematics that are successful. This will include training in how best to disseminate the knowledge and skills to other teachers in the school, through whole school INSET and by teachers working with the co-ordinator and, where appropriate, with other colleagues. We expect that all schools will participate in the training offered. It is important that we create a national mood for change to the most effective practices, and that teachers learn from one another's varying experiences. Those schools that are already achieving very high standards in numeracy will not necessarily go on to implement far-reaching changes in their existing teaching practices, not least because they are likely to be doing much of what we have in mind already. It will be important, however, that these schools use the information selectively to review and improve further their existing practice.

123 The changes in teaching practices that the strategy envisages will benefit all pupils, including those with English as an additional language and - with arrangements for particular support where necessary - those with special educational needs. We have also considered the need for progress in numeracy to be sustained and built upon in the transition from primary to secondary school.

124 Schools and LEAs need to facilitate the changes to be brought about by teachers in the classroom. We envisage that every school will develop its own plan for implementing the strategy, with the headteacher and governors taking

direct responsibility for raising standards of numeracy, after appropriate training. This plan should include an ongoing commitment to continuing professional development in mathematics. Our proposal to conduct further research into the National Numeracy Project and other programmes should provide data to help schools develop action plans that take their own particular circumstances into account. We envisage a national and regional management team for the strategy, similar to that now in place for the National Literacy Strategy, with local numeracy consultants recruited by LEAs to provide direct support to schools. Our recommendations also aim for a supportive climate in which the educational changes can take place - both through the active involvement and support of parents, and by improving the profile of mathematics in society at large. We have addressed the need for key educational bodies to contribute to creating the capacity for change at school level - QCA in its review of the National Curriculum and national testing arrangements, OFSTED in its inspection of schools, TTA in its work to secure a well-trained teaching profession and DfEE in its oversight and funding of education policy, particularly the implementation of strategies to improve both literacy and numeracy.

125 Our detailed recommendations are set out below, with the desired outcomes they are designed to achieve, and referring to the relevant paragraph numbers in the body of the report. Each places particular responsibilities on specific organisations and people. We expect, of course, that responsible organisations will consult and involve others in their work as appropriate.

Desired outcome	Recommendation

School Leadership of Mathematics *(paragraphs 23 - 25)*
 	
• *Headteachers and governors are clear about their role and responsibilities in improving standards of mathematics in their school and have the knowledge and opportunity to fulfil them effectively*
 	
• *Mathematics co-ordinators have clearly defined roles in relation to the improvement of mathematics, are clear about their role and responsibilities and have the knowledge and opportunity to fulfil them effectively.*
	DfEE:
	
	• Fund joint training for primary headteachers, a representative of each primary school's governing body, and mathematics co-ordinators, covering:
	  ◦ the National Numeracy Project's Framework for Numeracy and its requirements;
	  ◦ evaluation and monitoring of the planning, teaching and standards of mathematics at school level;
	  ◦ setting targets and creating an action and training plan to achieve them;
	  ◦ familiarity with material that is available to help schools in planning and managing mathematics; and
	  ◦ a whole school approach to mathematics homework and involving parents.
	• Fund further training for headteachers and mathematics co-ordinators, covering:
	  ◦ an overview of teaching methods and classroom organisation;
	  ◦ using the Framework for Numeracy to create teaching plans;
	  ◦ ensuring that appropriate emphasis is given to literacy and numeracy in the school timetable;
	  ◦ managing the teaching and assessment of mathematics;
	  ◦ setting realistic but ambitious numeracy targets for pupils, including targets in IEPs for pupils with special educational needs;
	  ◦ the role, deployment and training of classroom assistants to support numeracy;
	  ◦ homework activities to involve the family actively in developing children's numeracy;
	  ◦ the role of the headteacher in evaluating standards, and observing and offering feedback to teachers; and
	  ◦ the role of the mathematics co-ordinator in training and developing the professional expertise of other staff, including effective use of observation.
	• Fund the production of training material for schools and LEAs based on the National Numeracy Project's work, to ensure quality support and a consistent approach, including commissioned video material.
	• Fund a minimum release time of a quarter day per week for co-ordinators to disseminate best practice, and support their colleagues.
	
	TTA:
	
	• Ensure that NPQH, HEADLAMP and the new training programme for serving headteachers explicitly include training in the effective management of teaching and assessment of numeracy, and in monitoring and improving the school's standards in mathematics.
	• Ensure that further revision and development of standards for co-ordinators supports effective teaching and assessment of numeracy.
	• Address numeracy within the development of standards for SENCOs.

Desired outcome	Recommendation
	Headteachers: • Ensure that the school's mathematics co-ordinator has a clear role in drawing up the school's action plan for implementing the strategy, is given time and opportunity to work with colleagues and for any necessary training. • Ensure that the SENCO has the time and opportunity to work with the mathematics co-ordinator and with other colleagues to support the teaching and learning of mathematics, particularly numeracy, for pupils with special educational needs. Headteachers, governors and mathematics co-ordinators: • Attend the training, and develop an action plan for implementing the National Numeracy Strategy within the school, taking into account the school's particular needs. The plan should set clear targets for improving standards and be monitored and revised annually.
Opportunity to learn *(paragraphs 26 - 34)* • *A greater emphasis is given in the curriculum to oral and mental work to secure the foundations of numeracy, before formal written methods are introduced.* • *Teachers have a secure subject knowledge of mathematics that is relevant to the primary curriculum and to pupils' later development.* • *Primary schools give defined teaching time to mathematics, with daily lessons, a high proportion of which are devoted to numeracy.* • *Primary schools extend learning time through out of class activities and homework.*	QCA: • In the forthcoming review of the National Curriculum, shift the balance within mathematics towards oral and mental work to secure the foundations of numeracy, making explicit when formal written work is to be introduced. • Provide further exemplification material to help teachers make effective use of oral and mental work. DfEE: • Distribute copies of the National Numeracy Project's Framework for Numeracy to all primary and special schools and LEAs. Schools: • Audit teachers' subject knowledge and skills to ensure teachers receive continuing professional development appropriate to their needs. • All classes in mainstream primary schools to devote a daily timetabled lesson of between 45 minutes and one hour, depending on pupils' ages, to mathematics, having received the training and further guidance on how best to use this to teach and practise numeracy knowledge and skills regularly. • Special schools to devote a similar daily teaching time to mathematics, adapting this as appropriate to meet their pupils' needs. • Set regular mathematics homework for pupils that complements what is done in class, and involves parents (*see more detailed recommendations below*).

Teaching methods and classroom organisation
(paragraphs 35 - 51)
• *All children have the opportunity to take part regularly in oral and mental work that develops their calculation strategies and recall skills.*
• *Teachers know how to illustrate, demonstrate and explain mathematical concepts, offering models and contexts from which the key ideas can be extracted.*
	DfEE:
	• Fund training for the mathematics co-ordinator and one other teacher from every primary school, covering:
	  • familiarity with the Framework for Numeracy and its requirements, building on the training the co-ordinator will have received with the headteacher and governor;
	  • teaching mental calculation strategies;
	  • teaching and learning of number facts and multiplication tables, and how children can practise their instant recall in enjoyable and varied ways;
	  • effective use of number lines and other key resources;

Desired outcome	Recommendation
• *Teachers establish appropriate links between different topics in mathematics, and between mathematics and other subjects.* • *More time in mathematics lessons is devoted to interaction between teachers and pupils about mathematics, especially in interactions with the whole class, and also in groups.* • *Less time in mathematics lessons is spent working and trouble-shooting with individuals, and in using questions that do not challenge pupils to think.* • *Teachers are knowledgeable about the forms of classroom organisation that are most effective in improving standards of numeracy, and know when it is appropriate to use each particular form.* • *Teachers provide appropriately demanding work for pupils, with limited differentiation around work common to all pupils in one class.*	• the teaching of written calculations; • the teaching of fractions, decimals and percentages in Key Stage 2; • the National Numeracy Project's Framework for Reception, and the use of number apparatus and games to give facility with number in the early years; • teaching styles and classroom organisation; • planning a series of day to day lessons in detail; • assessing pupils' progress and setting targets in written, practical, oral and mental aspects of mathematics, and identifying misconceptions; and • how best to disseminate to colleagues what has been learnt. • Send every school, LEA and initial teacher training provider a copy of the National Numeracy Project publications: *Mathematical Vocabulary* and *Numeracy Lessons: Reception to Year 7.* • Commission new video material to accompany the training, and schools' own INSET in mathematics, developed from existing videos such as *Developing Mathematical Thinking* (used in Shropshire, showing progress in mental calculation strategies), *Hungarian Primary Mathematics Classes* (used by the National Numeracy Project) and the OFSTED video, *Teachers Count.* • Commission further work, in collaboration with QCA and TTA, and building on the National Numeracy Project, on aspects of mathematics at Key Stage 2, identifying pupils' misconceptions, including exemplification of pupils' work, and possibly video material. Schools: • Ensure that the mathematics co-ordinator and one other teacher attend the training course. • Commit an INSET day in the summer term of 1999, and two days of the INSET programme in the 1999/2000 school year to mathematics, building on what has been learnt in the training, and focusing on the implementation of the school's action plan. • Use this training and the Framework for Numeracy to take forward a change in teaching practices within the school, except where the Regional Director of the strategy, and the LEA, are satisfied that the school is already achieving sufficiently high standards of numeracy.
Classrooms that are resourced for learning *(paragraphs 52 - 53)* • *All teachers have access to key resources for the classroom and individual pupils, and use them effectively to teach mathematics.*	Schools: • Audit the resources provided for the teaching of mathematics, and ensure that every classroom has a board that is accessible and can be used for demonstrations and explanations, a number line and 100 square, and that there are sufficient resources for individual pupils to use. Teachers: • Use these resources to put into practice what has been learnt in training.
Information and Communication Technologies (ICT) *(paragraphs 54 - 60)* • *Teachers are well-informed about ICT that can enhance the teaching and learning of mathematics, and are confident and competent in using it.*	DfEE: • Follow up the results of the review of educational software to ensure that quality software is available to schools at the time of the implementation of the National Numeracy Strategy.

Desired outcome	Recommendation
• *The National Grid for Learning provides an up to date, accessible and stimulating source of ideas for the classroom and information about good practice for teachers.*	• Ensure that a database of good practice in teaching mathematics is included on the National Grid for Learning, including the opportunity for teachers to exchange ideas online with colleagues in England and in other countries. TTA: • Ensure that training funded through the Lottery equips teachers with the skills and information to select suitable ICT and use it effectively to support the teaching and learning of numeracy. • Include online teaching materials in the Virtual Teachers' Centre that support the National Numeracy Strategy.
Assessment *(paragraphs 61 - 68)* • *Teachers are clear about the learning objectives and progression in relation to pupils' knowledge, skills and understanding in mathematics, and can share this information with pupils and parents.* • *School assessment procedures help teachers to gather assessment information, to analyse it to diagnose pupils' strengths and weaknesses, and to identify the standards attained.* • *Curriculum planning builds on information obtained from classroom assessment by a variety of methods, including regular mental tests and oral questioning, with assessment at the start and end of a new topic and at random times during the year.* • *Pupils are involved in setting their own targets and in self-assessment, and receive feedback through comments about both the strengths and weaknesses in their work.* • *Recording systems give teachers the information they need to plan and report successfully, but are not too time-consuming to maintain.*	DfEE: • Ensure that the training for schools outlined above gives due attention to the importance of assessment of pupils' progress, setting individual targets and helping pupils to assess their own progress, and to analysing and recording the results as a means of raising standards of achievement. QCA: • Continue to publish annual commentaries on performance in the national tests, highlighting strengths and weaknesses in the tests and their implications for teaching and learning, as a means of encouraging further improvements in standards of numeracy. • Provide high quality progress tests for Years 2 - 6, matched to the National Curriculum, and building on the success of the optional Year 4 test, that will track pupils' progress in numeracy effectively throughout Key Stage 2. Headteachers: • Ensure that clear assessment procedures are in place and are monitored regularly. • Ensure that teachers make effective use of assessment information to inform their teaching.
The ratio of adults to pupils *(paragraphs 69 - 71)* • *Teaching assistants know what children are to learn, what teaching methods and mathematical terminology are involved, and work in partnership with, and are used effectively by, the teachers they are assisting.*	DfEE: • Review, and extend as appropriate, current training for Specialist Teacher Assistants (STAs) to support the National Numeracy Strategy.

Desired outcome	Recommendation
Initial Teacher Training (ITT) *(paragraphs 72 - 74)* • *Newly qualified primary teachers are equipped with secure mathematical subject knowledge and teaching skills.* • *Trained teachers have opportunities to observe good practice in mathematics teaching.*	DfEE • Send the Framework for Numeracy to all teacher training providers. TTA: • Ensure that ITT providers in schools and higher education institutions ensure that all those involved in training are properly equipped for their training role in relation to the new ITT requirements in mathematics. • Include a specific target in the NQT Career Entry Profile related to the teaching of numeracy, which should in turn be supported by induction. • Extend the teacher recruitment strategy to develop specific initiatives aiming to secure more mathematics specialists in primary schools as well as secondary schools. • In monitoring, with OFSTED, the implementation of DfEE requirements on mathematics subject knowledge in ITT, take into account the views of those implementing them early, and consider whether there is a need to develop national audit materials to help providers test whether trainees' subject knowledge meets these requirements.
Numeracy in secondary schools *(paragraphs 75 - 78)* • *Successful transition from primary to secondary schools, in which pupils' achievement in mathematics at Key Stage 2 is built upon, and developed throughout secondary school.* • *Secondary pupils have numeracy skills relevant to the world of work, and attractive to employers, and are well prepared to use higher mathematical skills in further study.*	DfEE: • Send the Framework for Numeracy to all secondary schools. • Run a pilot programme of summer numeracy schools, involving business and industry, and building on the lessons learnt in the summer literacy schools pilot. • Run a small scale pilot, to be closely evaluated, to find out how the benefits of the practices of the National Numeracy Project at primary level can be built on in Key Stage 3. QCA: • Develop a compendium of oral and written tests and more information about tests already available, supported by item analyses, and, where appropriate, national profiles and age standardised scores, to give secondary schools more and better information about incoming pupils' attainment in mathematics. • Develop improved arrangements for the transfer of pupil attainment records from one school to another, supported by appropriate software systems. TTA • Ensure that the ITT national curriculum for secondary mathematics emphasises the importance of pace, challenge and mental work. Secondary mathematics teachers: • Become familiar with curriculum requirements at Key Stages 1 and 2 and with the Framework for Numeracy. • Ensure pupils' mental strategies are fully developed during Key Stage 3, to raise standards of numeracy, running "catch-up" schemes where appropriate, to help pupils who arrive in Year 7 with weaknesses in numeracy. • Build up good links with feeder primary schools and ensure that gains achieved at Key Stages 1 and 2 are built upon.

Desired outcome	Recommendation
How the community can help *(paragraphs 82 - 84)* • *A clear change in cultural attitudes to mathematics from 1999/2000, that helps teachers and parents in their efforts to improve children's standards of numeracy.* • *An appreciation among young people, their parents and teachers of the benefits and relevance of mathematics qualifications for a wide range of careers.*	DfEE: • Initiate discussions with the mathematics associations and educational partners, with the aim of ensuring that the International Mathematical Year 2000 has an educational emphasis and encourages a positive attitude to numeracy and helping children to become numerate. • Use the experience gained and partnerships formed in the National Year of Reading to involve a wide range of business and media contacts in raising the profile of mathematics in 1999/2000, including the sponsorship of specific activities. • Provide information for teachers, parents and prospective undergraduates about the career advantages of qualifications in mathematics.

How parents can help *(paragraphs 85 - 90)*
 	
• *Pupils have regular, varied homework that enables them to practise what they have learnt in class and encourages input from parents into enjoyable home numeracy activities.*
 	
• *Parents are secure in their own numeracy skills and enjoy helping their children to become numerate.*
 	
• *EAZ models have a positive impact on numeracy standards, involving parents and other community partners.*
	DfEE:
	
	• Work with QCA and the Basic Skills Agency, building on the experience of the National Numeracy Project and Hamilton Maths Project, to produce a leaflet for parents about home numeracy activities, to be made available through supermarkets, covering:
	
	  ◦ the importance of numeracy for children and the role that parents can play;
	
	  ◦ what sorts of things children will be able to do at the end of each school year; and
	
	  ◦ some activities appropriate to their age, that parents can do with their children.
	
	• Fund the development of homework guidelines designed to support the roll-out of the National Numeracy Strategy.
	
	• In the light of the NFER evaluation, consider with the Basic Skills Agency whether there is any scope for extending their family numeracy programmes.
	
	• Ensure that some of the pilot EAZs include innovative projects to improve standards of numeracy.
	
	Primary schools:
	
	• Run an event for parents, governors and teachers about homework and the homework guidelines, how parents can help their child, and about the school's approach to mental calculation.
	
	• Use the homework activities leaflets above to:
	
	  ◦ Send home number games and tasks linking to the targets and activities in the leaflets; and
	
	  ◦ Set some more formal homework for older children, drawing on the homework guidelines and also linked to the targets and activities in the leaflets, to include some regular practice each week to consolidate work in class.

126 The following overarching recommendations are designed to ensure that DfEE, LEAs, and others explain the agenda for change clearly, provide the direction and support that will enable it to happen, and monitor progress effectively.

DfEE:

- Oversee the strategy through the Literacy and Numeracy Strategy Group, with a prime concern to ensure that the two strategies are implemented in a coherent way that does not overload schools.

- Appoint a management team to steer the implementation of the strategy at LEA level, including a National Director and a network of Regional Directors who each work closely with a cluster of LEAs, this infrastructure to be in place at least until 2002.

- Fund LEAs to appoint consultants to support schools in implementing the strategy, including target setting and monitoring progress.

- Provide training for Regional Directors and consultants covering their role in the region and individual LEAs, and materials to use when working with LEAs.

- Extend the evaluation of the National Numeracy Project, focusing particularly on the reasons for the improvements in standards the Project has achieved, and to understand what factors affect the variations in improvement between schools.

- Commission research on the impact of other programmes, such as that in Barking and Dagenham, which have been experimenting with international approaches, again focusing on understanding the reasons for variations in improvements between schools.

LEAs:

- Develop detailed action plans showing how they will implement, support and monitor the implementation of the National Numeracy Strategy at local level, giving a high priority to numeracy in their Education Development Plans.

- Appoint, and provide administrative support for, consultants to support the implementation of the strategy in schools, and designate an LEA co-ordinator to take responsibility for overall management of the strategy at local level.

- Ensure that all schools have access to the consultant according to need, especially schools with particular difficulties in numeracy.

- Ensure that special schools are included in the implementation of the strategy.

OFSTED:

- Ensure that inspections of schools include evaluation of their implementation of the National Numeracy Strategy.

- Ensure that inspections of LEAs include evaluation of their management of the National Numeracy Strategy

- Ensure that all inspectors of primary schools are well prepared to inspect numeracy, and know about the National Numeracy Strategy.

- Evaluate the impact of the National Numeracy Strategy in a substantial representative sample of schools from 2000 to 2002.

QCA:

- Continue to keep the national mathematics tests under review, so that they provide a fair, consistent picture of progress over time towards the 2002 target, drawing out for schools key lessons from the tests each year to support them in identifying areas for improvement.

- Take the demands of the National Numeracy Strategy into account in the course of the review of the National Curriculum, ensuring in particular that primary schools have enough time to give the necessary priority to numeracy.

- Ensure that further advice and guidance given to schools on teaching the mathematics curriculum and monitoring pupils' progress promotes the development of numeracy.

TTA:

- Ensure that providers of initial teacher training are well-informed about the National Numeracy Strategy and its implications for trainees, and continue to emphasise the importance of numeracy in professional standards for teachers and headteachers and associated training programmes.

- Ensure that the National Numeracy Strategy is reflected in work on continuing professional development, including headship training and the review of the professional development framework.

- Use the National Numeracy Strategy and activities in the World Mathematical Year 2000 to reinforce the recruitment strategy for primary and secondary mathematics teachers.

Questions for consultation

127 The Task Force would welcome comments on all aspects of this report and the recommendations. We are particularly interested in responses to the following questions:

- What training would headteachers, governors, mathematics co-ordinators and teachers find most helpful to secure effective management, teaching and learning of mathematics?

- What sequencing of training would be most helpful?

- Would it give a more comprehensive picture of progress towards the government's 2002 target to publish in performance tables either the average level reached by all pupils at Key Stage 2, or the number of pupils reaching each level, rather than simply the number of pupils achieving Level 4 or better?

- How can progress in numeracy best be maintained between Key Stages 2 and 3, and thereafter, during secondary school?

- How can the public profile of mathematics, and children's acquisition and enjoyment of numeracy skills best be promoted during the World Mathematical Year 2000?

- How can parents be most effectively involved in their children's learning of mathematics, and how can parents' own skills and confidence best be developed?

- How can homework best be used to help improve children's standards of numeracy?

- How can ICT best support teaching and learning in mathematics, now and in the future?

- How can special schools best be involved in the National Numeracy Strategy?

- Is there a need for a mechanism to allow groups, e.g. subject experts, parents, to put views about mathematics education to government and other key players that is not served by the DfEE's Literacy and Numeracy Strategy Group and existing organisations? If so, what form should this mechanism take, and to whom should it be accountable?

- How can the National Numeracy Strategy build on the National Literacy Strategy? Would it be appropriate for the National Numeracy Strategy to be more different in its structure and implementation?

- The implementation of both strategies will put pressure on the existing training days, if schools are to continue their more conventional training opportunities. What could be done by the government and others?

- How can research help to raise standards in numeracy and improve the quality of teaching?

If you would like more copies of the Numeracy Task Force report, please contact the DfEE orderline on 0845 6022260.

Please send your responses to the consultation to:

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