



OFFICE FOR STANDARDS
IN EDUCATION

THE
NATIONAL
NUMERACY
STRATEGY:
AN INTERIM
EVALUATION
BY HMI



A report from the Office of Her Majesty's
Chief Inspector of Schools

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EVIDENCE BASE

- 1 Her Majesty's Inspectors (HMI) are inspecting the implementation of the National Numeracy Strategy in a nationally representative sample of 300 schools. In the autumn term 1999, 170 of these schools were inspected. Two mathematics lessons were observed in each school, and interviews held with the headteacher and the mathematics coordinator. The sample includes schools in receipt of, or likely to receive, intensive support from their Local Education Authority (LEA) numeracy teams, as well as those categorised as "non-intensive" schools. HMI also visited the three-day and five-day training courses, met the regional directors of the Strategy, and discussed approaches to implementation with LEA numeracy consultants in a sample of LEAs. In addition to the inspection visits by HMI, an annual testing programme for pupils in Years 3, 4 and 5 of the schools in the sample has been established to collect data on pupils' attainment and progress in mathematics. Evidence from Section 10 inspections, conducted during the autumn term of 1999, was also taken into account.
- 2 This interim report covers the first term of the Numeracy Strategy. Its publication has been timed to enable schools and those with responsibility for managing aspects of the Strategy to act on its findings when drawing up programmes of intervention and support. A more detailed report on the first year of the Strategy will follow in the autumn. It should be remembered that the inspection visits by HMI were made in the early stages of the Strategy; the numeracy consultants had only recently been appointed and were new to the role.

MAIN FINDINGS

- 3 An encouraging start has been made. All the schools in the sample are teaching the three-part mathematics lesson in all year groups. Teachers have welcomed the *Framework* for teaching and have adopted it readily as the basis for their planning and teaching.
- 4 At the same time, however, the mathematical expectations of the *Framework* have shown up weaknesses in teachers' subject knowledge, particularly the teaching of progression from mental to written methods of working; problem solving techniques; and fractions, decimals and percentages.
- 5 The quality of the teaching was good in half the lessons seen; in these lessons, each of the parts was taught well with a good pace throughout. However, too often there was unevenness in the teaching and it was not unusual for there to be weaknesses in one of the three parts of the lesson.
- 6 The most effective element was the oral and mental work undertaken at the beginning of each lesson. This was taught well in six out of ten lessons; the best teaching ensured a variety of activities and provided a good range of open and closed questions to ask the class. Where the teaching was unsatisfactory, too much time was spent on the recall of number facts rather than expecting pupils to figure out new facts from known ones and explain how they had arrived at their answers.
- 7 The main teaching activity, in the middle phase of the lesson, was taught well in half the lessons seen. There were, however, significant weaknesses in the teaching of this phase of the lesson by almost one in five teachers. Where the teaching was weak, teachers were often unclear of their role and unsure whether to work with the whole class, groups of pupils, or individuals. Too often this resulted in a lack of focus to the teaching and a tendency for the teacher to flit around the class. Achieving an appropriate level of controlled differentiation is proving difficult for many teachers. On occasions the amount of differentiation is unnecessarily wide; in attempting to provide too many different tasks, the management of the class becomes difficult and opportunities for direct teaching are restricted.
- 8 The least successful element of the lesson was the plenary; in only four lessons in ten was it conducted well. In the one in four lessons where the plenary was unsatisfactory the teachers either ran out of time, or did little more than ask pupils what they had done during the lesson. Too often, plenary sessions were not used to identify and correct any common misconceptions or errors that had occurred in the lesson, or to reinforce the main teaching points.
- 9 Pupils' recall of number facts is becoming more accurate and faster. They are more aware of the strategies they use to calculate and are more often using the associated vocabulary correctly. Pupils' attitudes to mathematics are almost invariably positive. What is missing in these early months of the Strategy is the confidence to use and apply known number facts and calculating strategies to solve mathematical problems.
- 10 Systematic evidence of the impact of the Strategy on standards and progress will not be available until autumn 2000 but the results of the tests taken by pupils in the 300 sample schools last year provide a useful baseline of attainment for pupils in Years 3, 4 and 5. At the end of Year 4, the half-way point in Key Stage 2, only 58 per cent of the pupils had achieved Level 3 in mathematics; the profile of attainment in Years 3 and 4, judged against these initial test results, is too low. There is a more encouraging picture in Year 5 where the tests showed a better profile of attainment.
- 11 The results of the tests taken in the 300 sample schools revealed some worrying gaps in the mathematical knowledge and skills of the pupils. Pupils were confident with addition and subtraction but too many had difficulties with multiplication and division. Questions on fractions and decimals caused problems for many, particularly where pupils were required to convert one to the other. Knowledge of whole numbers was generally secure: pupils could recognise, record, compare and order numbers. Other strengths were reflected in their skills of estimation and rounding. Problem-solving, for example related to shopping, was a weakness, especially when pupils were required to read text rather than a column of figures.

KEY ISSUES AND POINTS FOR ACTION

- 12 The commitment and involvement of the headteacher have been important contributory factors to the success of the implementation of the Strategy. Almost half of the headteachers in the sample are providing strong and effective leadership. However, two aspects of the management role of headteachers are proving difficult: first, how to monitor and evaluate the quality of the teaching of mathematics in a way that helps to improve it; and second, how to analyse assessment data in order to establish curricular targets, which can be translated into action by teachers, and challenging but achievable numerical targets.
- 13 Much responsibility rests with mathematics coordinators for the training of their colleagues and the implementation of the Strategy. This has been a considerable challenge. In general, coordinators have responded well to the demands and are having a positive impact in most schools. The next stage for many coordinators is to help strengthen the quality of the teaching across the school, now that the basic structure of the daily mathematics lesson is in place.
- 14 The training provided by LEA numeracy consultants was received well by teachers. Those who attended the five-day training for intensive schools were very positive about its value. However, only a minority of teachers have had the opportunity to attend any of these training courses. Inspection evidence indicates that many more teachers need access to this training than the current arrangements allow.
- 15 Schools receiving intensive support have appreciated the help given by their numeracy consultant. Most consultants quickly established good working relationships with their schools and have been able to respond with good effect to their needs.
- 16 The “leading mathematics teacher” initiative has been well received by teachers; they have found it instructive to observe a colleague in another school teach in similar circumstances to their own. To be able to discuss the various aspects of the lesson has also been extremely useful, although some observers were poorly briefed about what to look for. Pre- and post-lesson discussions focused too much on classroom organisation and not enough on the teaching of mathematics.
- 17 The great majority of headteachers report that the Strategy has already led to improvements in both teaching and learning. The task for those responsible for managing the Strategy is to maintain the momentum of change and help teachers move beyond the basic introduction of the three-part daily mathematics lesson. It is particularly important to ensure that training and development address the gaps in teachers' subject knowledge.
- 18 The impact of the training has been powerful and its value much appreciated. The distance learning materials enabled mathematics coordinators in most schools to help teachers start teaching according to the principles of the strategy and the objectives of the *Framework*. Given that so far only a very small proportion of teachers have received the five-day training, and given that the existing weaknesses in the teaching of mathematics are largely concerned with teachers' subject knowledge, there is a strong case for extending the training programme, as a matter of urgency, to a greater number of teachers.
- 19 The impact of the LEA numeracy consultants has generally been positive. Quite properly, their work has principally been with those schools receiving intensive support. There remain many schools, however, where standards are modest but not sufficiently low to trigger intensive support, and which would benefit from more contact with a consultant.
- 20 Schools have readily accepted that greater attention should be given to the teaching of oral and mental mathematics, the recall of number facts, and developing strategies for calculating and solving problems. Other aspects of mathematics, such as shape and space and data handling, are given appropriate weighting in the *Framework* and its planning grids: teachers need to ensure that, in their enthusiasm for teaching number, the broader mathematics curriculum is not undermined.
- 21 There is uncertainty in some schools as to where responsibility for evaluating the teaching lies. In practice, much depends on the size of the school and the personalities involved. In small- or medium-sized schools, opportunities for the headteacher to delegate this task may be very limited, and most coordinators

have little non-contact time in which to visit other classes. In larger schools, headteachers may delegate a greater responsibility for this monitoring to a deputy or the mathematics coordinator. In either case success depends on the observer's mathematical knowledge, observation skills, and ability to provide constructive feedback in a way that improves practice. Many headteachers, deputies and coordinators need more help with how to evaluate the teaching of mathematics and how to take action to improve it.

22 There is a danger that too many new initiatives in primary education could deflect both the consultants and the schools from the crucial imperative of improving the teaching of mathematics. The priority remains to ensure that all possible support continues to be directed towards classteachers, on whose teaching the desired improvements in standards of mathematics depend

23 At this early stage in the implementation of the Strategy, attention now needs to be given to:

- ensuring that as many teachers as possible have access to the high-quality training and support available from numeracy consultants;
- ensuring that teachers have a better understanding of their role in the main teaching activity, and are clearer about the purposes of the plenary session;
- improving teachers' subject knowledge in those areas of mathematics which have been shown to be weak;
- helping headteachers, deputies and mathematics coordinators make the best use of assessment data and the *Framework's* key objectives, in order to produce challenging but achievable numerical and curricular targets that can be translated into action by teachers;
- providing guidance for headteachers and coordinators about how to evaluate the quality of the teaching of mathematics and take action to improve it.

STANDARDS OF ACHIEVEMENT

24 In addition to receiving inspection visits by HMI, the schools in the national sample have been asked to test pupils in Years 3, 4 and 5 in each of three successive

years. These test results, together with the annual results from the statutory tests in Years 2 and 6, provide a means of monitoring attainment in mathematics and measuring change over time. The Qualifications and Curriculum Authority (QCA) was responsible for the development of the tests, and commissioned the National Foundation for Educational Research to organise the administration of the tests and the analysis of results. The 1999 mathematics tests in Years 3, 4 and 5 are intended to provide a baseline against which to measure progress, and pinpoint strengths and weaknesses in pupils' mathematical skills, knowledge and understanding.

The following tables summarise the main strengths and weaknesses revealed by the tests in the 300 sample schools.

Year 3 tests

Strengths

Simple addition and subtraction of two numbers.

Interpreting the symbols for the four operations.

Reading information from a table.

Ordering and comparing numbers.

Weaknesses

Mixed operations (addition and subtraction) of three numbers.

Using equivalent words, such as minus and difference, for the four operations.

Interpreting information from a table.

Calculations using multiplication and division.

Year 4 tests

Strengths

Ordering 3-digit whole numbers.

Reading information from a table.

Addition, doubling and simple multiplication.

Using mathematical vocabulary.

Weaknesses

Questions with decimals and fractions.

Completing and interpreting a bar chart.

Reading mixed numbers and negative numbers on a number line.

Solving money and shopping problems.

Year 5 Tests

Strengths

Addition of one and two digit numbers to 1000

Finding simple fractional parts.

Using coins to undertake multiplication and division in context.

Ordering decimals.

Weaknesses

Multiplication and division (mental) and with larger numbers (written).

Conversion between fractions and decimals.

Word problems involving proportion.

Multiplication of decimals.

- 25 The test results from the 300 sample schools also showed that boys achieved slightly higher scores than girls and a slightly higher proportion of boys achieved the higher levels in each year group. Pupils eligible for free school meals achieved less well than other pupils. Black Caribbean and black African pupils under-performed relative to white pupils, and Chinese pupils significantly out-performed those from all other ethnic groups. Pupils more fluent in English performed better than those at earlier stages of learning English.
- 26 The analysis of the test results in terms of National Curriculum levels indicates the extent of the challenge ahead if the national targets for the year 2002 are to be met. The results achieved by pupils in the first two years of Key Stage 2 are worrying but the profile of attainment improves as pupils move through Years 5 and 6. At the end of Year 4, the halfway point in the key stage, only 58 per cent of pupils had reached Level 3. The poor progress across Years 3 and 4 needs to be addressed by the Strategy. All pupils who reach Level 2B or better at the end of Key Stage 1 need to reach Level 4. There is a still bigger challenge in ensuring that the majority of those pupils who achieved Level 2C at the age of seven also reach Level 4 by the end of Key Stage 2.

THE QUALITY OF TEACHING

- 27 The National Numeracy Strategy is now being implemented in all classes in the schools which were inspected by HMI in the autumn term 1999. All these schools have introduced a three-part, daily mathematics lesson, almost invariably timetabled for the morning, as well as a daily Literacy Hour. Almost all the lessons observed lasted for at least an hour, despite the recommendation that at Key Stage 1 the lesson should last about 45 minutes, and at Key Stage 2 between 50 and 60 minutes. Most schools are making good use of the *Framework* to help them produce medium-term plans for mathematics, defining half-termly or termly units of work, and short-term plans that usually cover a week.

Oral and mental work

- 28 The most effective element of the daily mathematics lesson has been the **oral and mental starter**. This was well taught in six in ten lessons. Teachers have

appreciated quickly the value of this session; they have seen its positive impact on the accuracy and speed of pupils' recall of number facts, and their greater understanding of strategies for calculating. Teachers have enjoyed the quickfire interaction with the pupils. Features of the most successful oral and mental starters were the effective and often ingenious use of resources to illustrate or help explain the mathematics being undertaken: for example, using number lines to help pupils to add and subtract by counting on and counting back, and hundred squares to identify addition and subtraction patterns. A common starting point for many lessons with younger pupils was the use of counting songs, rhymes and the chanting of number sequences, which helped to develop pupils' ability to order or identify numbers, or to reinforce simple addition and subtraction through the language of more and less.

- 29 Although this aspect of the mathematics lessons was the most successful, there were significant weaknesses in one in eight of the starter sessions. Some teachers made insufficient demands of their pupils: the questions were too easy, or the pupils were given too much time to answer them. More importantly, some teachers have not yet got the balance right between asking closed questions which require nothing more than rapid recall, and more open questioning which, for example, asks pupils to explain how they would set about solving a problem.

The main teaching activity

- 30 Half the **main teaching activities** were well taught, but the teaching of this part was weak in almost one in five of the daily mathematics lessons. The most confident and skilled teachers are recognising that in the main part of the lesson there is scope for variety, with a different mix of group work, whole class teaching, and paired or individual work on different days, to take account of the nature of the work being undertaken. For example, on one day groups of pupils might be asked to work collaboratively on investigating shape using mathematical apparatus. On another day the whole class might work with the teacher throughout the lesson on a specific aspect of mathematics such as halves and quarters or a written method of subtraction. Less confident teachers are uncertain about their roles and have a view that there

is a “preferred” way of working which does not change. In these circumstances, there is the danger that the teacher gives insufficient attention to direct teaching and flits between pupils, supervising their work rather than teaching them.

31 Achieving **controlled differentiation** is also a challenge for many teachers; sometimes the range of differentiation is unnecessarily wide, making it difficult for the teacher to work effectively with the whole class and making the organisation and preparation of group work very complicated. For example, when the work to be undertaken by different groups of pupils varies greatly this often means, in practice, that each task has to be explained and many pupils have to sit through an explanation that is irrelevant to them. Over-elaborate differentiation creates more administrative work than is necessary; the preparation of several different worksheets for each lesson is enormously time-consuming, and the intention of reducing the gap between the attainment of the different groups is unlikely to be met.

32 In some lessons, particularly at Key Stage 2, there are not enough opportunities for pupils to show how they have worked things out using numbers, symbols, equations and diagrams. The emphasis on oral work and mental calculation has led some teachers to stop demonstrating how best to record what mathematics has taken place in order to reach an answer. The *Framework* is clear about the need for both mental strategies and the use of progressively formalised approaches leading to standard written methods, although it recognises that standard written methods “are of no use to someone who applies them inaccurately and who cannot judge whether the answer is reasonable”.¹

The plenary

33 The least successful element of the daily mathematics lesson is the **plenary**. Only four in ten plenaries were good, and one-quarter were weak. The impact of many of the weakest plenaries was reduced by a lack of time. Typically, poor time management in the other elements of the lesson meant that the time originally allocated to the plenary was lost. Most teachers now recognise that a plenary should take place, but too many rarely go beyond just asking pupils what they

have learned. The best plenaries are used to draw together the key ideas of the lesson, reinforce teaching points made earlier, assess what had been understood, and correct errors and misconceptions. For example, in a Year 1/2 class, the plenary was used well to reinforce what had been learned about different ways of halving regular shapes. Much of the work in the main teaching activity had been practical and at two levels of difficulty. In the plenary, the teacher concentrated on the concept of a half, using examples of pupils’ work to demonstrate that, although the resulting halves they had created were in some cases a different shape, the fraction of the whole remained the same. Most pupils had divided their squares by a line parallel to one pair of opposite sides but one pupil had used a diagonal. The teacher made good use of this example to correct pupils’ misconceptions about halves. The lesson ended with the teacher checking pupils’ understanding by asking “Is this half?”, using pictures of everyday objects. This provided excellent challenge, revision and enjoyment, as well as leading to a useful investigation for the pupils to do as homework.

Aspects of teaching

34 **Planning and preparation** are proving to be very time-consuming, but most schools have made a good start to planning mathematics against the objectives of the *Framework*, and most have decided to follow a common format for their planning. A particular strength in the teaching has been the establishment of clear objectives for each lesson and the practice of sharing these with the pupils. This enables the teacher to remind pupils of these as the lesson progresses and to review them during the plenary. However, many teachers are still coming to terms with the need to step back from their daily and weekly plans in order to get an overview of the intended progress and development over a longer period of time.

35 In just under a half of schools the planning was good and it was at least satisfactory in nine schools in ten. In many cases, especially in larger schools, teachers worked in teams to spread the workload and pool their expertise. The best planning followed the *Framework* closely and included key questions for the teaching to address. Many teachers have found that by moving from their reliance on published

¹ *The National Numeracy Strategy. Framework for teaching mathematics*. DfEE, 1999. Introduction, page 7.

mathematics schemes, through which pupils worked at their own pace, and by following the year-by-year teaching programme set out clearly in the *Framework*, their expectations have been raised significantly. They have recognised, for example, the need to maintain the pace of their own teaching in order to ensure that the rate at which pupils progress is fast enough.

36 The difficulties of achieving the appropriate level of differentiation are reported above. Around one school in five is using the **setting** of pupils with similar levels of attainment as a way of narrowing the range within a class, most commonly in Key Stage 2. While teachers of sets often reported that it was easier to teach more precisely because of the narrower range of attainment, the quality of the teaching of setted lessons was virtually the same as that of non-setted lessons. However, the quality of the teaching of the “top” sets was better than that of lower sets; top sets were more often taught by the mathematics coordinator. Schools need to give careful consideration to the deployment of teachers for setted lessons, particularly the likely impact of the more skilled teachers of mathematics on the profile of attainment in a year-group and the effect this could have on the proportion of pupils achieving Level 4 by the age of 11.

37 Weaknesses in the teaching frequently related to teachers' lack of confidence and **subject expertise**. For example, teachers were confident when teaching towards objectives such as “Pupils should be taught to know multiplication facts by heart and derive quickly the corresponding division facts”. They were considerably less confident teaching higher-order mathematics, involving the application of knowledge and skills such as the solving of word problems, and the checking of answers by applying inverse operations or equivalent calculation.

38 The *Framework* has given very helpful guidance on what should be taught and when. It is also proving useful in enabling teachers to pinpoint aspects of mathematics in which they need further training. The most important training needs to emerge so far include:

- how to teach the inter-relationship between the four operations;

- how to teach the progression from informal mental methods to partial written methods “with jottings”, and then to the use of standard written forms;

- knowledge of problem solving techniques and skills;

- how and when to use calculators;

- how to teach fractions, decimals and percentages, and how to teach the conversion of one to another.

LEADERSHIP AND MANAGEMENT

The role of the headteacher

39 Almost half of the headteachers in the sample were providing effective leadership of the strategy; in one in ten schools the leadership was weak. The effective headteachers send strong signals to their staff about the high priority that should be given to the Strategy. They are positive about it, and have a firm commitment to the raising of standards. In many schools, particularly small and medium-sized schools, headteachers are taking a leading role through direct involvement; teaching a daily mathematics lesson, for example, either to one class or group, or selectively across the school. Such headteachers have a very good picture of the strengths and weaknesses of their schools and of the standards attained on a class-by-class basis. They also have a good knowledge of the *Framework*, can contribute to the school's training programme, and are in a good position to lead by example.

40 In large schools, the role of the headteacher varied widely. Effective headteachers ensure they are well informed about the Strategy, attend training courses, have some experience of teaching daily mathematics lessons, and know the quality of the teaching and learning in classes. Some, however, delegate far too much to their mathematics coordinators, making unrealistic demands on teachers who have very limited non-contact time in which to carry out their responsibilities effectively.

41 In most schools, approaches to the monitoring of the implementation of the Numeracy Strategy were still being developed. Usually there was a system for receiving and reviewing teachers' weekly plans, but too

often this was either too ambitious or lacking in focus. The monitoring of planning was helping headteachers to check in a general sense that the strategy was being implemented. It was not always being used, however, to ensure there was an appropriate balance between the different strands: for example, between numbers, calculations, problem-solving, measures, shape and space and data handling.

- 42 The other aspect of effective monitoring is the observation of teaching. At its best, this was involving the headteacher in a regular cycle of observations of all teachers, with an agreed focus and using a structured approach to the observation. This was followed up by a debriefing and feedback session, with points for development leading to the provision of advice or training.
- 43 The **analysis and use of data** were good in two in five schools and weak in one in five. The most effective headteachers have rapidly developed their skills of data analysis over recent years. They have established systems for collecting standardised assessment information which they use to assess strengths and weaknesses in attainment and trends over time. In the best examples, this analysis feeds into the target-setting process and leads to challenging but achievable numerical and curricular targets. Many schools are finding, however, that they cannot yet make the best use of the proliferation of quantitative data in order to track the progress of pupils or to set targets. While LEAs are increasingly providing schools with an analysis of standardised scores which compares one school with others, this does not identify the specific mathematical strengths and weaknesses of a school or help schools to set the most appropriate curricular targets.
- 44 The setting of **curricular targets** was the weakest aspect of management; it was good in only one in six schools, and was weak in nearly three in five. In too many schools, curricular targets, where they exist, are insufficiently precise to be translated into action that will raise standards. At best, curricular targets are specific statements of the mathematics that pupils need to be taught in order to make progress; the "key objectives" in section 2 of the *Framework* provide good examples of such targets. They should be linked

to precise periods of time and they should relate to whole year groups, particular classes, groups or individual pupils. In one school, for example, the mathematics coordinator had analysed the results of the QCA optional tests in order to identify aspects of mathematics that were weak in Years 3, 4 and 5. This led to very specific mathematical targets for the following year's teaching, as well as influencing the programme for the booster classes for the Year 6 pupils. Targets included adding four single-digit numbers mentally in Year 3; the reading of scales for measuring length, weight and capacity in Year 4; and solving word problems involving more than one step in the calculations in Year 5. The information from the test analysis was also incorporated into the planning of mathematics for each year group.

The role of the mathematics coordinator

- 45 Mathematics coordinators were having a positive impact on the implementation of the strategy in about half the schools; in one in six schools their influence was weak or ineffective. The most effective coordinators are skilled teachers of mathematics and teach demonstration lessons or parts of lessons for other teachers to observe. They are committed to their work and to their subject; they are energetic and well organised. Some, for example, maintain impressive subject files and collections of resources and ideas which they make available to the staff; and colleagues readily turn to them for advice and support.
- 46 An important aspect of the role of coordinators has been that of passing on the principles and essential approaches of the strategy to their colleagues; in most schools only two teachers were able to attend the three- and five-day training courses provided by their LEAs. Few coordinators received training in how to train others, and many reported that it is a demanding role and that "twilight" training sessions are not ideal for transmitting all the elements of the national strategy. The challenge for many coordinators remains how to help their colleagues to move beyond a mechanical implementation of the Strategy to using it to improve the teaching of mathematics.

47 Increasingly, coordinators were becoming involved in the monitoring of the implementation of the Strategy, although they were more confident at monitoring planning than the quality of the teaching. Where headteachers have delegated the monitoring of the teaching to the coordinator, many reported that they found it difficult to feed back to colleagues, particularly if the teaching they had seen was weak or the mathematics contained technical errors or basic misconceptions. In several schools, the coordinator had also been asked to provide written feedback to teachers but even the most capable found this a daunting task. Although the evaluation of teaching is an important aspect of the coordinator's work, it needs to be seen in the context of subject leadership in which the prime focus is on helping others to teach well through demonstration lessons, advice and support.

Leading mathematics teachers

48 An important and innovative feature of the Numeracy Strategy has been the provision of opportunities for classroom teachers to observe mathematics being taught by skilled practitioners in other schools. This initiative, using "leading mathematics teachers", enables teachers to visit another school to watch a daily mathematics lesson, usually with a year group similar to the one they teach in their own school.

49 The leading mathematics teacher initiative has been well received by schools. It has caused little disruption to the running of schools, and many teachers have found it reassuring to observe a teacher working in situations similar to their own. The teaching of the leading mathematics teachers in the lessons observed by HMI provided a model of teaching that was at least sound and often good. It is important that leading mathematics teachers are helped to provide more consistently good, as opposed to satisfactory, lessons for others to observe.

50 The discussions held before and after the lesson observed are very important elements in making the visit a success; teachers have the opportunity through these discussions to clarify areas of concern and take key messages back to their colleagues. However, the discussions need to be planned and managed very carefully. The pre-lesson discussions tended to be

more successful than those held after the lesson. The post-lesson discussions too often focused on issues of classroom management at a general level, such as teaching mixed-age classes or a wide ability range, rather than issues directly related to the teaching of the mathematics or to the subject itself.

51 In some schools with leading mathematics teachers, insufficient thought has been given to the management of the initiative and how observers are to obtain the most from the experience without disrupting unduly the work of the class. There should be a limit to the number of observers. The view of those managing the Strategy is that four is about the optimum number. It is important for observers to be able to move around the classroom and see what different pupils are doing, but again this must not distract pupils too much.

52 Many observers were insufficiently briefed about what they should look for in a lesson and what the outcomes should be for their own schools: dissemination at a staff meeting, for example. Early evidence suggests that this aspect of the initiative is too *ad hoc* and that schools could make better use of the experience.

SUPPORT FOR SCHOOLS: TRAINING, NUMERACY CONSULTANTS AND THE ROLE OF THE LEA

The training courses

53 In general, schools responded positively to the three-day **training**. Headteachers appreciated the overview it gave them of the Strategy and their role: "It confirmed what we needed to know and gave me a breathing space to talk it over with my coordinator" was a typical comment. The majority of the training courses were well paced and pitched at the right level. Inevitably, many consultants were inexperienced at leading training courses, and in some courses the mode of delivery was rather mechanical and did not include enough opportunity for discussion of the implications of the content of the course. About one in ten headteachers attended only part of the training or did not attend at all; on the other hand, some small schools were able to involve all their staff, and reported that this was a distinct advantage.

54 In schools receiving intensive support, the mathematics coordinators and one other teacher, often the special needs coordinator, were given five days of training. Most were extremely positive in their comments about the value of this training. They particularly appreciated the opportunity to extend their mathematical knowledge, and to discuss professional issues and how they would manage their leadership role. Several teachers commented that the course had increased their confidence to return to school and lead the training of the rest of the staff. Nevertheless, many had clearly found this aspect of their role extremely demanding, despite the generally positive response to the Strategy by the teachers in their schools. A few schools not entitled to receive intensive support paid from their own resources for places on the five-day training course. Even so, less than two per cent of primary school teachers have received the five-day training led by numeracy consultants.

The role of numeracy consultants

55 As with the National Literacy Strategy, a key role in the implementation of the National Numeracy Strategy has been taken by the LEA consultants. Over half of the “intensive” schools, which is where the consultants have been required to direct most of their attention, reported that this support had been good or excellent. The effective consultants quickly established good relationships with their schools and often responded rapidly to their needs. Their confidence, enthusiasm and expertise rubbed off in schools; and their recent and relevant teaching experience gave them added credibility when they taught demonstration lessons, led training or helped teachers with their planning.

56 An important part of consultants' work in many schools has been to support the headteacher in the evaluation of the quality of teaching. In most schools headteachers have greatly appreciated this support. The approach taken by the consultants has also been helpful to schools in the early stages of setting up their own monitoring systems.

57 The schools in the non-intensive group – the vast majority of schools – do not have an entitlement to

numeracy consultants' time. Nevertheless, where there had been contact it was almost always appreciated; activities had included leading a staff meeting; an input into training at a cluster group meeting; responding over the telephone to a request for advice; and clarifying issues at after-school surgeries or network meetings.

The role of other LEA personnel

58 The support from other LEA personnel, principally schools' link advisers, has, so far, been less effective and practice varied considerably from LEA to LEA. One-half of the schools reported that the involvement of LEA personnel other than the numeracy consultant had been either non-existent or unsatisfactory. Many commented that, although their link adviser had visited to discuss target setting, that person had insufficient expertise in primary mathematics to help the school. This was also a problem when non-specialist inspectors or advisers visited classes to monitor the teaching; their feedback was in some cases seen as less helpful than that given by consultants.

59 In one school in six there had been good-quality support from LEA staff, usually the mathematics adviser. Sometimes this support had been direct and in the school itself; sometimes it had come through meetings at a “maths centre” or through mathematics newsletters. Such advice and guidance were particularly appreciated in non-intensive schools, where one in four schools commented on their value.

60 Approaches taken by LEAs to supporting and monitoring the work of the leading mathematics teachers varied too much. The main monitoring mechanism used by LEAs was the use of review meetings, but in almost one-half of the schools there had been no monitoring of the work of the leading mathematics teacher by the end of the term. In only two of the schools visited by HMI had an LEA adviser observed the whole process of a demonstration lesson followed by the discussion with teachers afterwards.

OTHER ISSUES

61 Other adults, particularly **classroom assistants**, who were involved in helping with daily mathematics lessons brought a wide range of mathematical skills to their work. Most offered general support during the main teaching activity, but many have had little training in mathematics or the principles of the Numeracy Strategy. Greater priority in many schools has been given to the deployment of non-teaching staff in Literacy Hours, and literacy has usually received a correspondingly greater emphasis in the training of non-teaching staff.

62 Many schools have moved quickly to ensure that they have sufficient **resources** to implement the Numeracy Strategy, and in nine schools in ten levels of resourcing were at least satisfactory. Nevertheless, in one school in ten a lack of resources is hampering teachers' ability to teach mathematics effectively, particularly with regard to explaining and demonstrating with apparatus and using printed material to support group and individual work. Given the greater emphasis on direct whole class teaching, there is now less need for large numbers of textbooks through which pupils work at their own pace. Schools now need published materials, including books, that directly support the teaching and reduce the time-consuming task for teachers of preparing their own material. Most schools are building up their basic resources to teach the subject: number lines, digit cards, 100 squares, symbol cards for the four operations, counters, cubes, rulers, dominoes, dice, and so on. Good use is often made of white or black boards and, increasingly, of overhead projectors.

63 Issues related to poor **accommodation**, often the lack of a space in which pupils can be taught mathematics without the disturbance of extraneous noise, had usually already been addressed by many schools as they implemented the Literacy Hour the previous year. In open-plan schools, careful timetabling was helping to ensure that noisy activities were not programmed when quiet time was needed nearby, and many such schools had built dividing walls or screens.

64 The use of **information and communication technology (ICT)**, particularly computers, to support

the daily mathematics lesson was minimal in the lessons observed by HMI. Teachers generally sought to keep the class working together as far as possible, and were hesitant about how and when to introduce computers to support the teaching of mathematics. Although many teachers used ICT for planning and for developing or modifying worksheets, and a few reported that they were using and exchanging ideas from the Internet, the use of computers has had little impact so far on the teaching of mathematics.

65 About one-quarter of the lessons involving Year 5 and 6 pupils included some use of **calculators**. Their use was appropriate in half of these lessons. Occasionally, teachers used calculators to demonstrate, for example the effects of multiplying and dividing by ten. More usually, pupils used calculators to help them handle large numbers. However, many teachers lacked confidence in using calculators as a teaching aid and in teaching pupils how to make the best use of them. Teachers were also unsure when pupils should use calculators and for what purposes. Few pupils had been taught the necessary technical skills to make effective use of their calculators and few used the skills of rounding numbers and calculating mentally before turning to the calculator.

SPECIAL SCHOOLS

66 Special schools have welcomed their involvement in the Strategy. Most have introduced it for pupils in Key Stage 2 and there is a daily mathematics lesson for pupils in Key Stage 3 in almost every school. Teachers have appreciated the flexibility that the Strategy allows. Some adaptations to the *Framework* have been necessary for those with significant special needs but initial concerns that the length, content and format of the mathematics lesson would be too long have been dispelled. The plenary element has presented the greatest challenge and in some schools it has not yet been fully introduced. By contrast, in a small number of special schools teachers have developed imaginative and successful approaches to the plenary session. A particular problem for many special schools is the need to combine several year groups into one class and occasionally to combine two key stages in this way.

67 The majority of teachers in these schools are not mathematics specialists; many have found the *Framework* and the structure of the three-part lesson very helpful. Most headteachers consider that the Strategy is having a positive impact on teaching and learning. Pupils' attitudes to mathematics and their behaviour in lessons have improved. A notable success has been the improvement in pupils' oral and mental work. There has been a reduction in the use of work sheets and pupils are using mathematical vocabulary more effectively and with greater understanding.

CONCLUSION

68 Inspection has revealed some clear gains as well as some urgent needs. Improving teachers' subject knowledge remains a priority and there is still much work to be done on the consistency of the teaching of the three elements of the mathematics lesson. There is good reason to expect the progress made so far to be sustained and teachers and others with a stake in this Strategy should be pleased with what has already been achieved.