

The National Strategies

Primary



Steps to success in mathematics: Securing progress for all children



department for
children, schools and families

Steps to success in mathematics: Securing progress for all children

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The websites referred to in these materials existed at the time of going to print.

Please check all website references carefully to see if they have changed and substitute other references where appropriate.

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Introduction

Steps to success in mathematics: Securing progress for all children is a DVD-based compendium of National Strategies primary-focused mathematics materials and resources. These resources have been developed to help you to plan and provide teaching and learning in mathematics that will ensure all children make progress through the National Curriculum levels over Key Stages 1 and 2. The DVD is structured around a level-to-level approach and brings together the following publications and documents:

Securing levels

- Securing levels in mathematics for levels 1 to 5
- What I can do in mathematics for levels 1 to 5

Assessment

- Assessing Pupils' Progress mathematics guidelines for level 1 to 2, level 2 to 3, level 3 to 4 and level 4 to 5

Overcoming barriers

- Overcoming barriers in mathematics for level 1 to 2, level 2 to 3, level 3 to 4 and level 4 to 5

All of these publications are linked to the Primary Framework but to help you to access supporting materials the DVD also contains:

Supporting materials

- Primary Framework yearly overviews for each year group, 1 to 6
- Pitch and expectations for each year group, 1 to 6

Within this booklet you will find guidance on how to use the materials, with case studies drawn from schools that have made effective use of the resources. We hope you will find this compendium useful in your school to ensure all children make good progress in mathematics.

Guidance on using the materials

Using the compendium

Planning and delivering a mathematics curriculum that is challenging, engaging and broad, yet addresses and supports the needs of all children, is the aspiration of each and every primary school.

Steps to success in mathematics: Securing progress for all children is intended to support you in drawing upon the Primary Framework to personalise your mathematics teaching and children's learning so they achieve success and make progress. It is a compendium of the most popular and successful National Strategies' primary mathematics resources. The materials will help you plan learning at a rate that is appropriate and personal to children, to help them to secure this progress. The compendium has resources that will help to:

- build a picture of children's progress in relation to the levels of attainment for mathematics
- support and enhance your day-to-day planning and teaching from the Primary Framework
- identify children who are not making expected progress and plan and provide appropriate in-class support as part of guided group work
- revise provision for children who are ready to move beyond age-related expectations and progress at a rate that is suited to their attainment.

At the heart of the compendium is the learning and teaching cycle that is embedded within the Primary Framework: *review and assess – teach – practise – apply – review and assess*.

When using the compendium, you might start by reading the appropriate Primary Framework *yearly overview*. This describes the typical characteristics and mathematical learning of a child working at age-related expectations for the particular year group.

Reading the yearly overview, alongside the relevant *Securing level in mathematics* booklet, will help you to focus on six key areas of learning in mathematics that children must secure in order to attain the level, providing a checklist of aspects of mathematics to return to over a term and the year. These are two resources you might therefore include within your planning file, to refer to throughout the year and to annotate as a reminder of what has been learned successfully and what should be revisited.

With this bigger picture in mind, the Primary Framework blocks and units provide support for medium-term planning that covers a period of two or three weeks and identifies assessment opportunities to help you plan the learning and teaching cycle. When planning you might refer to the appropriate Assessing Pupils' Progress guidelines, to think about how to build in assessment opportunities. The *Pitch and expectations* documents also provide a useful bank of questions that are linked to both the Primary Framework objectives and to National Curriculum levels. Identifying questions to use over the unit of work can support both the teaching and the assess and review phases of the learning and teaching cycle; constructing additional questions by altering details will provide children with practice to hone their skills. Incorporating the appropriate *What I can do in mathematics* booklet will provide a tool to engage children in the assessment process. You could plan opportunities when children can complete a question or section to keep a record of their progress

towards the key aspects of mathematics specified within the *Securing level* booklets. These can be shared with parents and carers to help them to see what their child can do and what they might do to help. The probing assessment for learning questions within each Primary Framework unit also provide additional questions to build into your planning and teaching.

By using the compendium and the Framework's blocks and units, you can translate the big picture into teaching units that steer day-to-day teaching. Planned assessment for learning opportunities will inform that planning, and evidence can be collected and noted to support periodic assessment against the APP guidelines. Of course, children will learn at different rates and some will encounter barriers and their progress will suffer. This is the point at which materials within *Overcoming barriers in mathematics* provide you with additional guidance and support. They will help you to identify the root of the problem and to plan the support the children need to overcome the barrier. This support might be provided within the context of a guided group, within the daily mathematics lesson, or, if appropriate, individually as additional support outside the mathematics lesson. Planning quick and direct intervention in the class is often the best way to deal with barriers to learning. The *Overcoming barriers in mathematics* materials should be seen as a resource that informs intervention support in the context of whole-class planning, whatever the chosen method of delivery.

Your planned assessment for learning opportunities, the information you record against the six key areas in the *Securing levels in mathematics* materials, or alongside the yearly overview and the child's own record in the *What I can do in mathematics* document, will all contribute to the emerging picture of children's progress. Towards the end of a unit you might use some amended *Pitch and expectations* questions or carry out

focused discussion and activities with children to refine your assessment of learning over the unit. All of this will inform your periodic judgements when you carry out the APP process and refer to the guidelines and supporting materials. The APP guidelines have been included on the compendium and additional guidance can be found on the National Strategies web area.

www.standards.dcsf.gov.uk/nationalstrategies

Select 'Primary', 'Assessment', 'Assessing Pupils' Progress'.

Securing levels in mathematics

The *Securing levels in mathematics* booklets address key areas of learning in mathematics that children must secure to attain a given level. There are five booklets that cover level 1 through to level 5.

Each booklet identifies six areas of mathematics. While these are not the only areas of mathematics children should experience, they are key areas that children must secure in order to attain the level. There is a double-page spread for each of the six areas of mathematics, which sets out the standards to be achieved and suggests some teaching approaches, relevant intervention materials, teaching and learning resources and assessment prompts. These sections are intended to help:

- clarify the standards to meet the level for that area of mathematics
- identify what children need to know, understand and be able to do to meet these standards
- provide approaches to teaching and learning that will help children to make progress
- draw on and engage children in using a wide range of models, images, practical resources and intervention materials
- build a picture of children's attainment within the level.

The booklets are also underpinned by a series of key messages about teaching and learning in mathematics that will help ensure that children are engaged in and challenged by their mathematics teaching.

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Securing level 3 in mathematics

Securing mental addition and subtraction

Level 3 standards to be achieved:

- Use number facts and place value to add and subtract one and two digit numbers efficiently
- Use informal jottings, including number lines, in several stages to mental calculations
- Use appropriate oral methods and written methods to solve problems
- Use a range of mental methods, when and use the most appropriate depending on the numbers in a calculation
- Use appropriate calculation methods to solve problems involving addition and subtraction

How an progression of mental methods to explain steps in written methods for addition and subtraction

For children to attain level 3, they need to:

- use known facts to work out related ones, for example, use $7 + 8 = 15$ to work out $37 + 8$ and $100 - 80$
- partition two digit numbers to support efficient calculation, for example, $41 - 19 = 21 + 20 = 19$
- know that one number from one stage equals a calculation
- use the inverse operation to check answers, particularly for subtraction, for example, check $36 - 18 = 18$ using $18 + 18 = 36$
- identify the appropriate calculation(s) needed to solve a problem
- consider the numbers involved in a particular calculation to make appropriate decisions on which mental method to choose
- work out subtraction by counting backwards and by counting forwards and decide which is the most efficient method for particular calculations
- use correct mathematical vocabulary to describe/explain their calculation methods.

Make sure that:

- children rehearse addition and subtraction facts regularly through daily and/or mental work
- children are encouraged to give answers to their sums in large enough calculations
- encourage children to move from counting strategies to using known facts to calculate efficiently
- children are able to add and subtract multiples of 10 and 100 regularly using known facts
- use part of an operation when calculating the wrong digit, for example saying that $87 - 38 = 48$ because $80 - 30 = 50$ and $7 - 8 = -1$
- children can find missing numbers in calculations such as $47 - \square = 29$
- children understand and use appropriate vocabulary including the term 'difference'
- children have regular opportunities to explain and compare calculation methods
- you use children's understanding of mental methods, such as partitioning, as the basis for the development of written methods, initially using expanded methods.

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The National Strategies (Primary)
Securing level 3 in mathematics

Teaching and learning resources

Resources:

- Number lines 43 - 38 = 17
- Number line 17

Addition and subtraction facts progression

Intervention materials

Springboard 4
Levels 2 and 3

Overcoming barriers in mathematics - level 2 to 3

- Can I recall and use addition and subtraction facts for the numbers to 20?
- Can I find pairs of numbers that total 500?
- Can I make mentally combinations of one digit and two digit numbers?
- Can I use a subtraction fact that is the inverse of an addition fact and vice versa?

Wave 3 materials
see 'Wave 3 booklet 4'

Assessment checklist

User outcomes	Assessment outcomes
I can add two digit numbers, choosing an efficient method	What number is 27 more than 41? What number is three more than 41? Explain how you worked out these two calculations. Work out the missing digits: $□2 + □2 = 68$
I can subtract one and two digit numbers, choosing an efficient method	Work out these subtraction calculations: $70 - 9 = 30$ and $30 - 9 = 40$ and $40 - 9 = 31$ Do you use the same method for each calculation? If not, why not? Explain and make sure you understand and explain to your partner.
I can recall the steps of the addition/subtraction methods	Work out $47 + 38$. Record how you work this out and explain when you have worked.
I can check my answer to a calculation	Paul says $71 - 11 = 48$. Write down an addition calculation that could do the reverse. Paul's working is $70 - 10 = 60$ and $60 + 2 = 62$ so $72 - 10 = 62$. Where has Paul gone wrong?
I can use addition and subtraction to solve problems	Luca has 4p in my money book and 3p in her purse. How much more money does she need to buy a comic that costs 17p?

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Using the *Securing levels in mathematics* booklets

Each booklet identifies areas of learning that are crucial for children to secure the relevant level in mathematics. The ideas from these materials can be integrated into ongoing planning and teaching, and can also be used to plan targeted support for particular groups of children or individuals.

What I can do in mathematics

The *What I can do in mathematics* booklets complement the *Securing levels in mathematics* materials. Each booklet takes the assessment prompts from the corresponding *Securing level in mathematics* publication and presents them in a form that can be used by children to record their mathematical working and answers.

The booklets provide a working resource that can be used as an ongoing record of the progress a child is making in each of the six key areas of mathematics. A booklet can be referenced at appropriate times for assessment evidence and can be reviewed with the child at the end of an appropriate teaching sequence, to identify what progress has been made. The booklet could also be shared with:

- tutors and teaching assistants when planning support for a child or group of children
- other teachers to help transition
- the child, to discuss and record their progress
- parents or carers to show them what their child has achieved in mathematics and how they might help them to make greater progress.

Using the *What I can do in mathematics* booklets

Each short booklet provides a way of engaging children in identifying and recording their own progress and can be used to set targets for a child or group of children. These materials are not intended to be used as sets of worksheets, to be distributed to a group of children, but as an ongoing reference document

that helps to set expectations and record achievement over time.

You may choose to amend the heading of the final column on each page and use these documents to record the names of children who might require particular help, against each of the 'I can' statements. This could provide a tool for tutors or teaching assistants to give feedback to a teacher or for a teacher to pass on to another colleague at the end of a year, as the children change classes.

The 'I can' statements could also be used to identify targets or learning objectives at the start of a unit of work. They could be shared with the class during the teaching sequence, and associated assessment questions used to explain and explore the mathematics required to answer them and to support children's understanding of what they can do.

Name:

My counting, comparing and ordering numbers		
My I can statements	Examples of questions I can answer	My working and answers
<i>I can count forwards and backwards in equal steps and describe any patterns in the sequence</i>	<p>Here are some numbers in a sequence: ..., 7, 9, 11, 13...</p> <p>Will the following numbers also be in the sequence: 3, 16, 21, 58? Explain how you know.</p> <p>Write the missing numbers in this sequence.</p> <p>53 48 43 38 <input type="checkbox"/> <input type="checkbox"/> 23 18</p>	<p>.</p> <p>53 48 43 38 <input type="checkbox"/> <input type="checkbox"/> 23 18</p>

Overcoming barriers in mathematics

The *Overcoming barriers in mathematics* materials provide teaching resources and ideas that can be used when planning support for children who meet barriers in their learning that slow or block their progress. The materials draw upon many existing National Strategies materials, link directly to the Primary Framework and provide extra support and guidance designed to support children in overcoming identified barriers to progress.

The areas of mathematics within the materials were informed by a scrutiny of the performance of children whose attainment was close to, but fell below, a particular level boundary. This analysis was further supported by evidence from QCDA reports, research evidence and feedback from teachers and consultants. The evidence pointed to a number of common barriers in mathematics that often prevent children from making progress – the bits of mathematics children find difficult to learn, which are often the bits that are more difficult to teach.

A guidance booklet accompanies each of the *Overcoming barriers in mathematics* resources. At the back of each booklet is a useful sequence of charts that make links between National Curriculum level descriptions, common barriers to progress, the Primary Framework objectives and the materials within the resource.

Using the *Overcoming barriers in mathematics* materials

The materials are accessed through the mathematics strands and learning objectives, and are structured around the cycle that underpins the Primary Framework: *review and assess – teach – practise – apply – review and assess*. Each stage is supported by example questions, prompts or linked materials.

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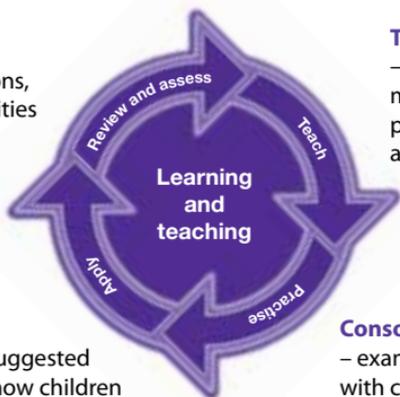
Steps to success in mathematics: Securing progress for all children

Example review questions

– example questions to help refine barriers and identify misconceptions

Confirming learning

– questions, prompts and activities to probe children's learning



Teaching guidance

– key vocabulary, models, images and practical resources and teaching tips

Opportunities to use and apply

– suggested prompts to show how children might use the mathematics

Consolidation and practice

– example resources to use with children within guided or independent work

The materials are designed to be used flexibly and as appropriate for your planning and teaching context. The materials can be used with an individual child or in a guided group context with children who share similar barriers to progress. Ideas from the resource can also be used to inform ongoing planning.

Primary Framework: Yearly overviews

The yearly overviews for mathematics describe the typical characteristics and mathematical learning of a child working in each year group at age-related expectations. Each overview exemplifies the following sections:

- the learner
- using and applying mathematics
- counting and understanding number
- knowing and using number facts
- calculating
- understanding shape
- measuring
- handling data
- embedding key aspects of learning.

Using the *Primary Framework* yearly overviews

You can use the overviews to:

- become familiar with the pitch of the curriculum, if you are new to a year group
- help communicate to a range of audiences, including parents, the mathematics being taught and learned during the year
- provide benchmarks for the range and depth of teaching and learning in mathematics to support monitoring and evaluation
- gain an overview of the mathematics in a year group, from which to identify strengths and weaknesses of a cohort and target teaching more effectively
- help a teaching assistant gain an understanding of age-related expectations to help them to support a wider range of children within a class.

Assessing Pupils' Progress (APP): Mathematics guidelines

Assessing Pupils' Progress (APP) is a structured approach to in-school assessment linked to national standards. The *mathematics guidelines* provide the criteria for each National Curriculum level and form one of the key documents of APP. They support the assessment of children's work in relation to national standards and provide a simple recording format for the criteria in each of the assessment focuses in mathematics at every level.

Using the APP mathematics guidelines documents

One of the greatest values of APP is the way it can help you learn more about children's strengths and weaknesses in different aspects of mathematics. Over time, APP judgements can also tell you how a pupil is progressing and alert you if they fall off trajectory. This is the basis for intervention planning to help children to progress.

The guidelines might be used to identify any:

- gaps in learning for most of your class so that you can adjust your planning to focus on these areas of underperformance
- gaps in learning for a group of children so you can plan some guided learning sessions to address the particular needs of those children
- children who may benefit from other more sustained intervention.

Counting and understanding	
Numbers and the number system	
L4	<ul style="list-style-type: none"> • recognise and describe number patterns, e.g. <ul style="list-style-type: none"> – continue sequences involving decimals • recognise and describe number relationships including multiple, factor and square • use place value to multiply and divide whole numbers by 10 or 100
	<p style="text-align: right;">Level 4</p> <ul style="list-style-type: none"> • understand place value in numbers to 1000

Teaching assistants and teachers working in partnership

By working in partnership, teaching assistants and teachers can ensure all children experience high-quality teaching throughout the learning and teaching cycle. When working with the class, groups or individuals, teaching assistants can undertake a variety of roles including pedagogical support, modelling learning, supporting discussion, observing and assessing.

Making time for joint planning between teachers and teaching assistants, together with regular opportunities to review progress, will support teaching assistants to make effective use of the materials within this compendium and undertake some of the roles outlined below.

Review and assess

- Observe and make notes about children's responses and reactions to questions asked by the teacher, such as those from the 'Example review questions' and 'Confirming learning' sections of the *Overcoming barriers in mathematics* materials.
- Ask children questions from the *What I can do in mathematics* booklets and make a record of their responses and approaches within this booklet.

Teach

- Use the teaching tips in the *Overcoming barriers in mathematics* 'Teaching guidance' documents when working with groups or individuals.

- Promote discussion and model and provide opportunities for children to use key vocabulary accurately.
- Help children to use some of the models, images and resources suggested in the *Overcoming barriers in mathematics* and *Securing levels in mathematics* materials.
- Adapt and use relevant intervention materials with small groups and individuals, such as those linked to the *Overcoming barriers in mathematics* materials.

Practise

- Use the suggested ICT-based and practical resources within the *Overcoming barriers in mathematics* and *Securing levels in mathematics* materials when working with small groups of children or an individual child.
- Provide feedback on the progress children are making and on any difficulties they are experiencing.

Apply

- Use some of the suggested starting points for enquiry from the *Overcoming barriers in mathematics* materials.
- Observe and make notes about children's approaches to solving problems, how they respond to questions such as those in the *Pitch and expectations* documents and the mathematics they use and apply independently.

Case studies and further guidance

Introduction

The following case studies illustrate ways in which schools have made effective use of the *Overcoming barriers in mathematics* materials. The case studies share some common factors:

- **leadership** – the active support and involvement of the headteacher to ensure improving progress in mathematics is a school priority
- **staff CPD** – dedicated time to introduce and gain familiarity with the materials, alongside a colleague
- **teaching assistants** – teachers working in partnership with teaching assistants to use the materials to plan and deliver support for targeted children
- **intervention** – the materials forming part of a school intervention strategy to raise the achievement of focus groups of children.

The schools identified two key features of the materials:

- **Primary Framework** – the materials being easy to use and linking directly to the Primary Framework, therefore supporting planning
- **assessment** – the ‘Can I...?’ questions, helpful when assessing children’s understanding; assessment information being used to identify gaps in pupils’ learning and then the appropriate *Overcoming barriers in mathematics* materials being used to fill these gaps.

Case study A: Year 3

The *Overcoming barriers in mathematics* materials were used to enhance overall teaching and learning. The materials were used in the following ways.

- As a resource when planning for the whole class – the *Overcoming barriers in mathematics* and *Securing levels in mathematics* materials were drawn upon during planning, and appropriate resources were used to support Quality First teaching, particularly the interactive teaching programs (ITPs), vocabulary list, probing questions and links to mathematics challenges. Areas of mathematics that were ‘difficult to teach, difficult to learn’ were pre-empted and ideas from the materials were used to try to avoid misconceptions from the outset. The ‘Can I...?’ questions and associated materials were integrated into daily mathematics lessons to help identify children who needed extra support.
- As an intervention resource for a target group – children were identified through outcomes at the end of Key Stage 1, APP and ongoing assessment. The *Overcoming barriers in mathematics* materials provided an immediate resource, linked to the areas of mathematics the children were finding challenging. Children from the target group had regular mathematics support from a teaching assistant, in addition to their daily mathematics lesson. Most of these children were performing at level 2C but the group was flexible. If another child was struggling in a particular area they could join this group, as appropriate. The ‘Teaching guidance’ documents gave instant ideas about how to approach an area of mathematics with children who were stuck.

Subsequent tracking and assessment information indicated that using the materials helped many children to make good progress and to gain a secure understanding of the specific concepts that were focused on.

The success of the *Overcoming barriers in mathematics* materials at this school was due to:

- the clarity and quality of the resources
- time set aside for staff development
- strong subject leadership
- good support from the local authority.

Case study B: Year 1 to 5 intervention strategy

The *Overcoming barriers in mathematics* materials were used to support intervention from Year 1 to Year 5 to raise the achievement of focus groups of children who had been identified through the APP process. In addition to the daily mathematics lesson, the focus groups had two sessions per week with teaching assistants who had worked alongside the teachers during a school training day. The school took the following steps to make effective use of the materials.

- The teacher identified areas of difficulty, through APP and ongoing assessment information such as marking and feedback, and observation.
- Relevant learning objectives were identified and the associated *Overcoming barriers in mathematics* 'Can I...?' questions were selected.

- The selected *Overcoming barriers in mathematics* materials were annotated by the teacher, with the specific group in mind, in order to select and tailor the resources needed.
- The teaching assistant used the annotated version to deliver sessions with the focus group. This group was flexible, with children joining the group according to their needs.

The teaching assistants held a weekly evaluation meeting with the mathematics subject leader. They felt that the materials were easy to use and welcomed the clear guidance and teaching tips and the suggested questions and vocabulary that supported their practice and helped them address children's needs in a more targeted way.

The success of the *Overcoming barriers in mathematics* materials at this school was due to:

- the ease of use of the materials that are built around the learning and teaching cycle
- the links made to practical resources, such as the ITPs
- using the 'Teaching guidance' documents, particularly the teaching tips, to support the learning and teaching of difficult to teach concepts.

Case study C: Year 1

The school prioritised use of the *Overcoming barriers in mathematics – helping children move from level 1 to level 2* resource with a group of ten Year 1 children in a mixed-age class. The materials were used as a resource during ongoing planning to help tailor teaching to identified learning needs and to help children overcome specific difficulties. The resource provided easy access to high-quality materials that linked exactly to children's particular learning needs and therefore made planning easier.

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The *Overcoming barriers in mathematics* materials enhanced and consolidated practice and the children made the following progress.

	Below average	Average	Above average
Beginning of Year 1	3 children	4 children	3 children
End of Year 1	0 children	2 children	8 children

The success of the *Overcoming barriers in mathematics* materials at this school was due to:

- the active support and involvement of the headteacher
- CPD from the local authority, which included use of the materials during a gap task
- the way the materials support targeted planning to identified needs
- the high quality of the resources, with all the materials available in one place
- using the 'Confirming learning' sections to help ensure children really have a good understanding of a concept
- the ease of use – good-quality planning was easier and took less time.

Case study D: Year 6

Following a trend of declining standards, mathematics became a school improvement focus and the headteacher identified use of the *Overcoming barriers in mathematics* materials as an essential part of the school development plan. The Year 6 teacher took part in a project that drew on the use of *Overcoming barriers in mathematics* materials and was asked to take the lead in using the materials

within the school. This teacher went on to become a leading teacher and now supports the use of the *Overcoming barriers in mathematics* materials in schools within the local authority.

The materials were used with:

- **Target children**

APP was used to identify children with specific areas of strength and difficulty. The *Overcoming barriers in mathematics* resource was then used to plan support for children with identified barriers to learning. The teaching assistant was involved in supporting these children during additional sessions, while the teacher also ensured he worked with them for at least one session a week during the daily mathematics lesson.

- **Children on the cusp of attaining the next level or those needing to make accelerated progress**

An additional support teacher was timetabled to work with these children for a few short sessions each week. During this time she worked one-to-one with them, using the *Overcoming barriers in mathematics* materials and other relevant resources, to target their specific barriers.

- **The whole class**

Some elements of the *Overcoming barriers in mathematics* resource were used with the whole class, particularly the ITPs and the questions within the 'Example review' and 'Confirming learning' sections. As a result of reviewing and assessing the children's learning in this way, those who needed any additional support or practice were quickly identified.

Use of the *Overcoming barriers in mathematics materials* helped improve the confidence of the target children and, as a result, these children began to take part more fully in whole-class sessions, taking greater risks with their learning.

The success of the *Overcoming barriers in mathematics* materials at this school was due to:

- the ease of use, as the materials are all located in one place
- the cyclical approach of the learning and teaching cycle
- high-quality materials – everything is useful
- the emphasis on review.

Case study E: Year 3/4

The materials were introduced to the teacher over a two-day LA course that set a gap task focusing on the use of the *Overcoming barriers in mathematics* resource.

Through discussion with the headteacher and mathematics subject leader, use of *Overcoming barriers in mathematics* was written into the school development plan, as one strategy to improve standards in mathematics.

The learning and teaching cycle (*review and assess – teach – practise – apply – review and assess*) was already used within planning; the *Overcoming barriers in mathematics* materials enhanced and made this easier, as it was quick and easy to find effective targeted activities to meet the exact needs of the children.

The materials were used as a planning tool to support learning needs as they arose. Other interventions, such as Springboard, were 'dipped into' as needed and were accessed via the *Overcoming barriers in mathematics* materials.

Throughout the school, APP was used as an assessment tool and the 'Can I...?' questions supported the assessment of children's understanding. As gaps were identified, the appropriate *Overcoming barriers in mathematics materials* were used to help overcome the barriers to learning.

There was a noticeable improvement in the confidence of children, particularly those who were underachieving in mathematics. These children became more likely to 'have a go', especially at problem-solving tasks, whereas they were previously hesitant to participate.

The success of the *Overcoming barriers in mathematics* materials at this school was due to:

- time to explore and share the materials with colleagues to gain a good understanding before using them
- how the materials are set out to tackle specific difficulties
- the speed at which you can find activities that match specific objectives
- the confirming learning questions, which help assess children at the end of a unit.

Case study F: Year 5/6 and Year 3/4

The materials were initially introduced to the whole staff by the school mathematics subject leader. The teachers in Years 5 and 6 identified a target group of children who were not on track to reach level 3. These children had been assessed, using the 'Commonly encountered difficulties' section of the *Overcoming barriers in mathematics* booklet and the assessment checklist from the *Securing level 3* and *Securing level 4* materials.

A programme of work for these children was developed, based on the *Overcoming barriers in mathematics* resources and this informed the daily mathematics lessons for a small group of targeted children throughout the summer term.

At the beginning of the academic year this group of children were working within level 2 but, after targeted use of the

Overcoming barriers in mathematics and *Securing levels* materials, all the children achieved at least level 3, with two of the nine children achieving level 4 in the Key Stage 2 national tests.

The materials were also used in Years 3 and 4. Assessment outcomes were used to identify six or seven children in each class who were not on track to reach level 3. The school mathematics subject leader devised a programme of work, based on the 'Commonly encountered difficulties' from the Number strands of the *Overcoming barriers in mathematics* materials, and the target group was supported by a teacher or teaching assistant during daily mathematics lessons. These children also had support from their class teaching assistant, in addition to daily mathematics lessons, in small groups to suit their needs.

Assessments of the children at the end of term indicated that several had made accelerated progress in comparison with their peers.

The success of the *Overcoming barriers in mathematics* materials at this school was due to:

- the clear link between the *Overcoming barriers in mathematics* and the *Securing levels in mathematics* materials
- use of the suggested questions in the 'Example review' and 'Confirming learning' sections of the *Overcoming barriers in mathematics* resource.

Case study G: Mathematics subject leader and Year 4 teacher

The mathematics subject leader worked with a local authority mathematics consultant to gain understanding of the *Overcoming barriers in mathematics* materials. The materials were used in partnership with a teaching assistant in her class before introducing the materials to all staff.

Teacher assessment indicated that while the majority of the class were working at or beyond level 3, six children were working just below level 3. These children were not secure in counting and understanding place value. The *Overcoming barriers in mathematics* and *Securing levels in mathematics* materials were used to help address these identified gaps and support the children's learning. Sessions for identified children were planned and then delivered by a teaching assistant, outside the daily mathematics lesson. Time was then found to discuss the children's progress so that opportunities to practise and consolidate skills were planned.

Five out of the six children who were supported outside the daily mathematics lesson began to demonstrate knowledge and understanding within level 3. For one child, the barriers were more deeply rooted and further support was required.

The subject leader identified the following next steps for the school.

- Discuss with other class teachers the gaps in children's mathematics learning, in order to identify any common barriers across the school.
- Lead an initial staff meeting to begin to familiarise teachers with the materials. Initially, focus on a common barrier and look at the available support materials across all of the

Overcoming barriers in mathematics resources.

- Demonstrate how the materials have been used so far to help children overcome identified barriers.
- Link the introduction of these materials with specific staff-development sessions on APP.
- Use the materials to support teachers' CPD by asking them to consider the mathematics needed to understand one of the *Overcoming barriers in mathematics* 'Can I...?' questions, in order to appreciate the depth of learning that is involved in what can appear to be a simple statement.

Case study H: Developing the use of number lines across the school

The mathematics subject leader identified a limited repertoire of mental and informal calculation strategies among children within the school. Subsequent conversations revealed that many teachers did not fully recognise the importance of number lines in developing children's understanding of number and supporting them with calculations.

A staff meeting was organised to introduce the *Overcoming barriers in mathematics* materials and for teachers to work in pairs to look through the resources for implicit and explicit references to the use of number lines.

The subject leader used the *Overcoming barriers in mathematics* materials to:

- clarify the use of and progression with number lines throughout the school
- explore how number lines can be used in different contexts and aspects of mathematics

- address any misconceptions about how the use of number lines develops from Year 1 to Year 6
- work with teachers to look at samples of children's work, to identify how number lines had been used and to discuss what information this reveals about children's understanding of the number system
- develop a consistent whole-school approach to the use of number lines, so that every teacher was confident in the concepts, models, images and vocabulary that accompany number lines in different contexts.

Case study I: Supporting one-to-one tuition

Children in the school who were not making expected levels of progress were identified and the teachers reviewed their planning and analysed individuals' work to identify areas of difficulty and possible misconceptions. The charts from the *Overcoming barriers in mathematics* booklets were then used to match these to suitable 'Can I...?' questions within the resource.

Example of how the materials were used to support a child

A child who had not made expected progress towards level 3 was identified. The teacher looked through examples of his work and, in discussion with the mathematics subject leader, concluded that the child was confident in writing three-digit numbers but not when these included zeros (he would write 408 as 4008). While he was able to read three-digit numbers, when shown two such numbers he could not always say which was bigger;

nor could he identify multiples of 10 that lie between two given numbers.

The tutor used the *Overcoming barriers in mathematics – helping children move from level 2 to level 3* materials, particularly the 'Read, write and order whole numbers to at least 100' objective and associated 'Can I...' questions selected from the 'Counting and understanding number' strand.

Many of the models and images from the 'Teaching guidance' documents were used; for example, place-value cards and the *Place value* ITP were used to help the child to make, read and write numbers containing zero and to discuss questions such as 'Why isn't the 10 card needed to make 301?' and 'Which cards will you need to make 408?' Various number lines were then used to help the child order numbers accurately, to support his developing knowledge of writing numbers that contain zero and to develop a greater sense of the relative size of numbers.

The 'Consolidation and practice' pages made links to relevant Springboard units which were adapted and used within the sessions. At the end of the series of sessions, the one-to-one tutor used the 'Confirming learning' questions to assess the child's understanding.

Overcoming barriers in mathematics and pupil progress meetings

Pupil progress meetings provide opportunities for regular, professional dialogue about the rates of progress of individuals and different groups of children within each class, each year group and across the whole school. Children with insufficient rates of progress can be identified and factors behind this can be explored.

The *Overcoming barriers in mathematics* materials can be used to help pinpoint mathematical reasons for slower rates of progress. Samples of children's work can be examined, alongside the appropriate *Overcoming barriers in mathematics* resource and questions posed such as these.

- How is the child performing, compared with national expectations? How does this compare with other children in the same cohort or across the school?
- Has the child been given sufficient opportunity to show what they understand and can do?
- Are there any common misconceptions shared by all children working within the same level, the same class or the same year group? What have the teachers done as a result?
- What use has been made of the *Overcoming barriers in mathematics* materials? What professional development do teachers need, to make more effective use of the materials and to understand the concepts within them?
- How can existing mathematics plans be modified to incorporate a greater focus on areas of identified weakness?
- Which practical resources highlighted within the *Overcoming barriers in mathematics* materials are readily available within school? Which materials are teachers confident in using?

Overcoming barriers in mathematics and pupil interviews

Pupil interviews can be used to explore children's attitudes towards mathematics, their understanding, preferred strategies and the standards they are achieving. They can reveal misconceptions and inefficient strategies that are common to groups of children and can assess how well groups of vulnerable children are progressing. The questions asked during pupil interviews can be drawn from the 'Example review questions' found within the *Overcoming barriers in mathematics* resource. While some of these questions may be suitable for oral questioning, and others may be better written down, they all provide the opportunity to observe how children reach their answer – the mathematics, the strategy and recording they chose to use.

During and after the interviews the teacher might consider some of the following questions.

- Could the children answer questions appropriate to their age group or assessed level?
- Were they able to answer questions independently or did they need additional guidance to get started?
- Was any support needed due to lack of confidence or a lack of understanding of the mathematics involved?
- Did the children have a variety of strategies that they could use when answering questions?
- Where questions were answered incorrectly, was this due to careless mistakes or due to misconceptions?
- Were there particular types of question that children had difficulty with?
- What are the implications for future planning and teaching?

Mathematics subject leaders can conduct pupil interviews across the school. This would provide an overview of whole-school issues as well as detailed information about particular children.

The subject leader could consider the following questions.

- What consistency is there in the methods and strategies children are choosing to use in each class, each year group or across the school?
- Are the methods and strategies used appropriate and do they match the children's conceptual understanding?
- Are there common misconceptions or do these vary between different groups of children?

Quotations from teachers who have used the *Overcoming barriers in mathematics* materials

I begin by drawing on the 'Overview of learning' from the Framework and alongside this use the appropriate *Securing level* booklet and the appropriate *Overcoming barriers in mathematics* resource. I like to plan with these documents open in front of me. I consider which objectives I need to teach and those that need practice or consolidation, drawing from what I know about the children's prior learning.

Year 5/6 teacher and mathematics subject leader

Mapping out a two-week plan, I consider which objectives can be incorporated into an oral and mental starter, the main part of the lesson, or plenary. I then draw on the *Overcoming barriers in mathematics* materials to support and draw out relevant questions

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to incorporate into my planning. Scanning through the materials, I seek out relevant resources... I sometimes say to myself, for example, 'I forgot all about that particular ITP, I need to use that.'

Year 5/6 teacher and mathematics subject leader

The presentation of the strands, levels and yearly objectives is absolutely fantastic and so easy to use and navigate, with links to other resources such as Springboard...

Year 5 teacher

Teaching assistants are finding the materials easy to use and they welcome the clear guidance, teaching tips, questions and vocabulary, which really support their practice – they feel they are addressing children's needs in a more targeted way.

Year 2 teacher

I particularly like the link between the *Overcoming barriers in mathematics* and the *Securing levels* materials. They gel together beautifully and I like to work with both documents alongside each other. The deputy headteacher/SENCO particularly likes the 'Review and assess' section.

Mathematics subject leader

The teaching guidance immediately gives me ideas of how to approach a topic or objective with children who are stuck.

Year 3 teacher

The materials are clear and simple, and linked directly to the Framework, so I was able to use them straight away.

Year 3/4 teacher

Audience: Teachers, mathematics subject leaders,
headteachers, local authority consultants

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