The National Strategies
Primary

Moving on in mathematics

Narrowing the Gaps

department for
children, schools and families

Moving on in mathematics

Narrowing the Gaps

First published in 2009
Ref: 01082-2009BKT-EN

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DSI CMM 12-2009

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Introduction

This publication sets out ways to help primary schools to be more successful in narrowing the gaps in attainment in mathematics. It is intended to be used by mathematics subject leaders and class teachers, in collaboration with members of schools' senior management teams to support those who work with children to secure their learning in mathematics.

The importance of children realising their potential in mathematics is shared by all schools and teachers. We want children to have confidence in their mathematical ability and to attain well so that they have the best life chances. Those children who, at the end of Key Stage 2, achieve level 4 or above in both English and mathematics are far more likely to gain five or more A*–C grades at GCSE than those who don't. Children who achieve level 4 or above in mathematics at the end of Key Stage 2 are four times more likely to gain an A*–C grade in mathematics than those who achieve level 3. End of Key Stage 2 outcomes make an enormous difference, and Key Stage 2 outcomes are a result of progress made throughout the Early Years Foundation Stage, Key Stage 1 and Key Stage 2.

Background data

Since 1997 there has been a 9 percentage point rise in the proportion of children achieving level 2B+ at Key Stage 1 and a 17 percentage point improvement at both level 4+ and level 5 at Key Stage 2.

While great gains have been made, it remains a challenge to ensure that all children make good progress in mathematics. The figures below illustrate some of the national gaps in progress and attainment.

- Early Years Foundation Stage Profile (EYFSP) data for 2009 shows that girls did better than boys in all problem solving, reasoning and numeracy (PSRN) scales. In 2008, 72 per cent of all children achieved 6 or more points in calculating compared to 56 per cent of those children who were entitled to free school meals (FSM).
- In 2008, more than 20 per cent of children did not make at least two levels of progress in mathematics from Key Stage 1 to Key Stage 2, with only 52 per cent of children who achieved level 2C at Key Stage 1 achieving level 4 or above at Key Stage 2.
- In 2008, at the end of Key Stage 2, 63 per cent of children who were entitled to FSM achieved level 4 or above in mathematics compared to 82 per cent of children who were not entitled to FSM.
- In 2008, at the end of Key Stage 2, 69 per cent of Black children achieved level 4 or above in mathematics compared to 77 per cent of all children.
- Data for 2009 shows that 10 per cent of those children who achieved level 4 or above in English did not achieve level 4 or above in mathematics.
- Data for 2009 shows that 37 per cent of boys achieved level 5 in mathematics at the end of Key Stage 2 compared to 32 per cent of girls.

In most schools there are groups of children who do not make the progress in mathematics of which they are capable. These groups might include girls or boys, children from disadvantaged backgrounds, those entitled to FSM, those with special educational needs and/or disabilities, gifted and talented (G&T) pupils and those from some minority ethnic groups. Some of these children go unnoticed in mathematics lessons; they may have low expectations of their capability in mathematics and are not always recognised as underperforming.

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The challenge

A major challenge relates to children from disadvantaged backgrounds. There is still a strong link between disadvantage and underachievement and there needs to be a determined effort to narrow the gaps in achievement, especially in mathematics.

Schools that successfully manage to narrow gaps in mathematics refuse to accept background, gender, ethnicity or race as an excuse for poor progress and attainment. The school culture is one where every child is visible and valued. They use data to identify the children at risk of underachieving and pinpoint aspects of mathematics that are presenting barriers to their learning. They look out for children who have low confidence in mathematics and work to build up children's self esteem, whilst offering genuine challenge and setting high expectations. They adopt a range of teaching approaches, taking into account the needs of individuals and groups of children.

Based on their identification of gaps, these schools engage in professional development, reflecting and evaluating its impact on learning, and in refining and strengthening quality first teaching. They know that as some gaps close, others may appear but they are ready to tackle new challenges as successfully as they did for others.

Key issues

Narrowing the gaps in attainment in mathematics remains a national priority. In addressing this priority there are four key aspects to consider which are set out in the diagram below.

Focus of the booklet

The sections of this booklet reflect the aspects of the diagram and an overview is provided on the following page. The section *Pinpointing and narrowing the gaps in mathematics* is a key part of this publication. It can be used to help you look closely at current practice in mathematics lessons and offers suggestions for developments and changes that can make a real difference to children's learning.

We hope you find this publication helpful in your drive to tackle the underperformance of particular groups of children in mathematics and to identify ways of accelerating progress.

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Sections overview

Know the gaps

Section 1 of this publication focuses on identifying children with gaps in attainment and making them visible.

Use a range of attainment and progress data (national, school and class) to identify which children are underachieving in mathematics and need to make better progress.

Use this section to help you to consider some questions when:

- using RAISEonline to find which groups historically underachieve in your school
- looking at EYFSP
- using live tracking data to help find children in your school who are not making sufficient progress
- using Assessing Pupils' Progress (APP) to provide further information on these children and to identify aspects of mathematics that appear to be barriers to progress
- using question-level analysis.

Narrow the gaps

Section 2 focuses on pinpointing and narrowing the gaps in mathematics. Having identified the children who are not making sufficient progress, use this section to help you to:

- identify obstacles to progress
- decide whether current practice in teaching and learning mathematics meets the needs of all learners
- decide what practice needs to be adapted or changed in order to enhance pupil progress.

There are five aspects in this section:

- Attitudes, aspirations, behaviour and attendance
- Mathematical knowledge and skills
- Mathematical processes
- Language
- Fit for purpose pedagogy

This section also contains information about using the 'Overcoming barriers' and 'Securing levels' materials.

Mind the gaps

Section 3 focuses on evaluating and sustaining impact. Having carried out actions and changed practice, use this section to help you to:

- consider whether the changes and actions implemented have made a difference
- think about how the impact can be sustained.

Celebrate gap busting

Section 4 focuses on how success can be shared. Use this section to help you to:

- be aware of ways in which you can build on and share your success both in and beyond the school.

Supporting materials

Use Section 5 to help you to find references to helpful publications.

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Section 1: Identifying children with gaps in attainment in mathematics

Who are the children that are underachieving in mathematics?

How can they be identified?

Mathematics subject leaders play a key role in identifying gaps in progress and attainment. Being familiar with the different sources of data and analysing them will provide a clear picture of where the gaps are and for which children across the school. Individual teachers also need to know how to access and analyse data for their own children, knowing their past progress and tracking ongoing progress. It is important that everyone understands the picture that the data analysis gives and where the underperforming children are.

In order to narrow the gaps in mathematics progress and attainment we need to identify the children or groups of children who are not making the progress in mathematics of which they are capable. These children might include FSM, G&T, Black and minority ethnic (BME) pupils, boys or girls, pupils with English as an additional language (EAL) and/or Gypsy Roma Traveller children. This is not an exhaustive list and some children will be in more than one group.

This section of the booklet illustrates forms of data commonly used by schools. It provides prompts and questions to use alongside them to help identify individuals or groups of children who have fallen behind or are likely to fall behind and to hypothesise why this might be so. This can be followed through into Section 2 of the booklet. The analysis is only useful when it leads to identification of groups and named pupils and to targeted action to accelerate progress. Identification of these pupils can take place at class, year-group, key-stage and whole-school level.

RAISEonline

This can be used to identify attainment gaps. Analysis of historic or retrospective data, including trends over time, is important in ensuring that schools know where strengths and areas for development exist in terms of:

- gaps between performance of groups of children in the school compared with the same groups nationally
- gaps between performance of groups of children in the school (for example, children entitled to FSM versus children who are not entitled to FSM, boys versus girls).

Average point scores, 2008, for all national curriculum core subjects by pupil type

This report provides analysis of key stage 1 pupils average point score in 2008 for the national curriculum subjects.

	All NC Core Subjects			Reading			Writing			Mathematics		
	School		National	School		National	School		National	School		National
	Cohort	APS	APS	Cohort	APS	APS	Cohort	APS	APS	Cohort	APS	APS
All Pupils	59	14.0	15.2	59	14.5	15.7	59	13.4	14.3	59	14.0	15.8
Gender												
Male	34	13.9	14.8	34	14.2	15.1	34	13.5	13.5	34	14.1	15.8
Female	25	14.0	15.7	25	15.0	16.3	25	13.2	15.0	25	13.8	15.8
Free School Meals												
FSM	22	13.4	13.3	22	13.7	13.5	22	12.6	12.2	22	13.9	14.1
Non FSM	37	14.3	15.6	37	15.0	16.1	37	13.8	14.7	37	14.0	16.2

Average point score data

Percentage of pupils attaining or surpassing each level in 2008 for Key Stage 2

This report shows the percentage of pupils in the school and nationally who attain or surpass the required standard for each level.

Levels achieved in 2008 for Key Stage 2 mathematics

	Level 3+				Level 4+				Level 5+			
	Cohort	School	National	Sig	Cohort	School	National	Sig	Cohort	School	National	Sig
All Pupils	60	95	95	-	60	83	80		60	30	31	
Gender												
Male	29	97	95	-	29	79	81		29	38	35	
Female	31	94	95	-	31	87	79		31	23	28	
Free School Meals												
FSM	31	90	90	-	31	74	65		31	23	16	-
Non FSM	29	100	96	-	29	93	83		29	38	34	
English as a First Language												
English or believed to be English	9	100	96	-	9	100	81	-	9	67	32	-
Other than English or believed to be other	51	94	93	-	51	80	75		51	24	27	
Unclassified	0	0	8	-	0	0	5	-	0	0	1	-

Threshold measures

Some of the following questions have been adapted from, *Narrowing the Gaps: from data analysis to impact – a practical guide.* Ref: 00912-2009PDF-EN-07 .

Average point score (APS) data

In mathematics, how well do children entitled to FSM perform compared to the school average for all pupils? For non-FSM pupils? Is the gap narrowing or getting wider compared to previous years?

How does the gender gap in mathematics in the school compare to the gender gap nationally? How does the gender gap in English compare to the gender gap nationally? When comparing with national gaps, do both English and mathematics show the same difference?

Threshold measures

How well do pupils from ethnic minority groups attain in mathematics compared to school and national averages on statutory threshold indicators?

Value-added data

Is there a difference in the pattern of progress in mathematics between more-able pupils and that of their peers?

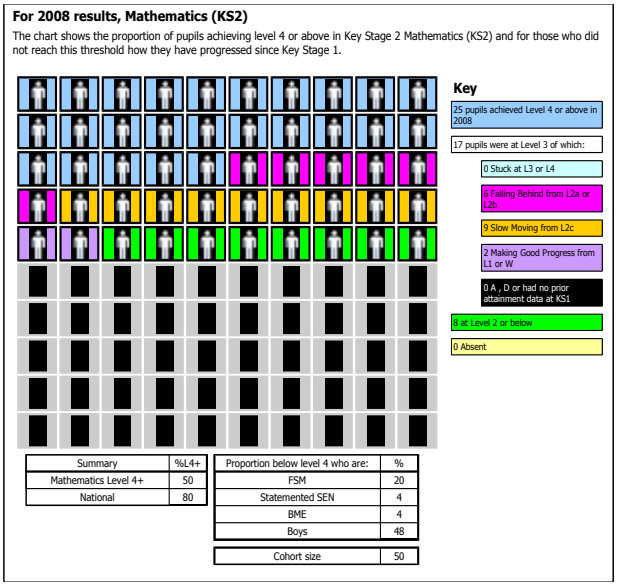
Contextual value-added (CVA) reports

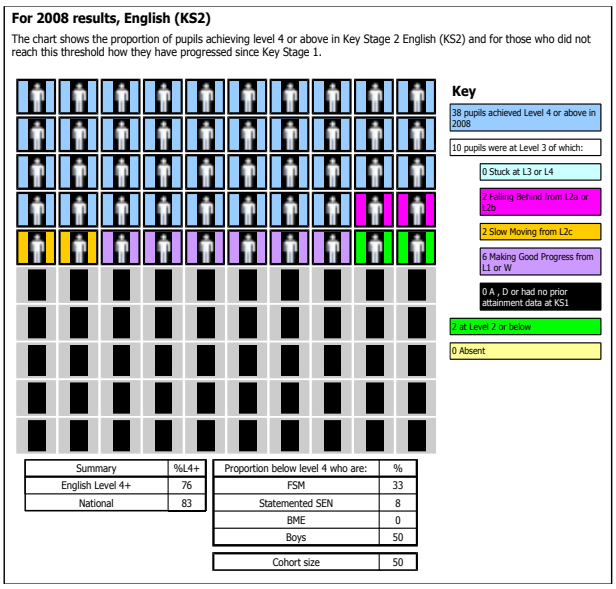
Are groups that have historically underperformed in mathematics making enough progress to narrow attainment gaps?

For mathematics, how many pupils lie above the tenth percentile line, or below the ninetieth percentile line? Is either of these groups dominated by a particular group of pupils (for example boys, girls, pupils entitled to FSM, pupils from ethnic minority groups)?

Conversion charts

Which groups of pupils make slow progress in mathematics? How does progress in mathematics compare to progress in English?





EYFSP data

As part of data analysis, mathematics subject leaders and class teachers will need to look at EYFSP outcomes. It is important that the EYFSP is analysed at scale point level rather than looking at total scores.

- How do the school's EYFSP outcomes compare with the national picture?
- Are there differences in attainment patterns across the three PSRN scales?
- Are there gaps for individuals and groups of children?

This, together with knowledge of parents and staff, should help to identify the children who need additional help in Year 1.

Live tracking data

This helps to make visible those children currently in school who are not making the progress in mathematics that they ought to be. Schools use a range of different systems to track children's progress. Not all tracking systems look the same; the important point is that they should be fit for purpose.

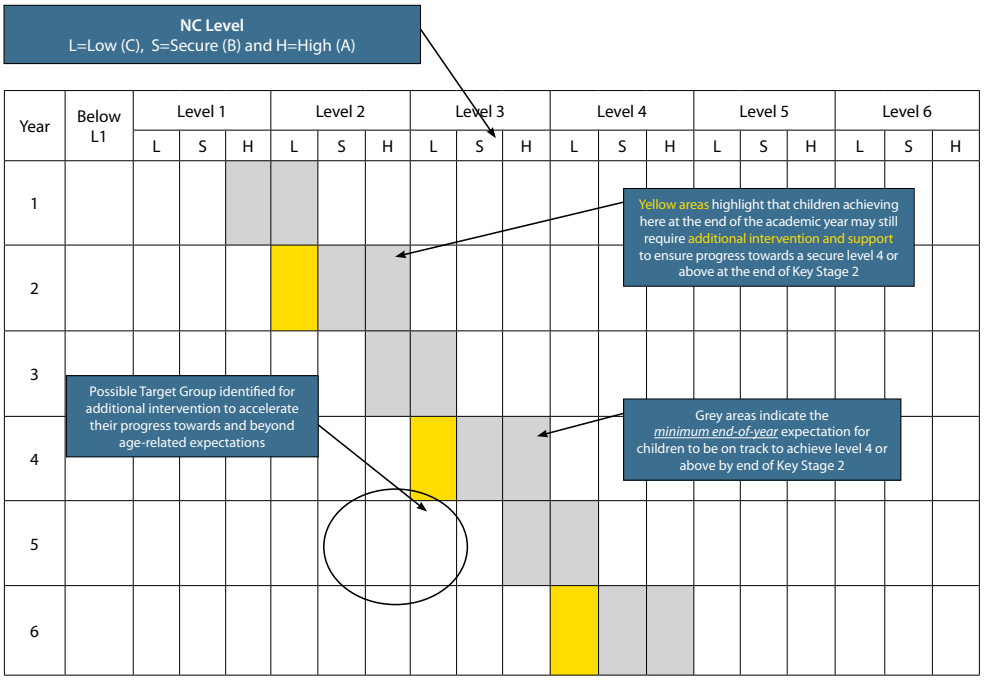


Chart taken from *The Improving Schools Programme Handbook* Ref: 00314-2009BKT-EN

This type of tracker allows patterns of progress and attainment across the whole school to be seen in relation to age-related expectations. Classes and cohorts where attainment is particularly good can be identified as well as those where attainment is not so good. Taking account of each child's prior attainment to establish the rate of progress, this pattern can be discussed and acted upon.

- Is each child where they should be based on their prior attainment?
- Are children on track to make at least one level of progress during Years 3 and 4?
- Are there significant underachieving groups emerging? For example, children entitled to FSM, boys, girls or minority ethnic groups?

The **combined attainment tracker** is a spreadsheet on which termly attainment and progress can be recorded for a class/cohort of children. It allows a close look at the progress of children across reading, writing and mathematics. Once information has been entered into the spreadsheet, filters can be made on gender, FSM, ethnic minority, new arrivals, etc.

For each class, are there children who are making expected progress and on track to achieve age-related expectations or above in either reading or writing or both but not mathematics?

- Are they predominantly girls/boys?
- What about the proportion of FSM children in this group?
- Are there patterns throughout the school/key stage?

Look carefully at children whose prior attainment was level 2+ at Key Stage 1.

- Are they on track to make two levels of progress by the end of Year 6?
- Are there children whose prior attainment was level 2+ at Key Stage 1 in English and mathematics and are on track to achieve level 4+ in English but not mathematics?

There needs to be a continued focus on the achievement of girls in mathematics; two-thirds of those not making two levels of progress in mathematics from Key Stage 1 to Key Stage 2 but who make two levels of progress in English are girls.

- What about children who achieved level 1 in mathematics at the end of Key Stage 1? Some of those children will be capable of achieving level 4 at the end of Key Stage 2. Are they making accelerated progress?

Assessing Pupils' Progress

	Using and applying mathematics		
	Problem solving	Communicating	Reasoning
L4	• develop own strategies for solving problems, e.g. – *make their own suggestions of ways to tackle a range of problems* – *make connections to previous work* – *pose and answer questions related to a problem* – *check answers and ensure solutions make sense in the context of the problem* – *review their work and approaches* • use their own strategies within mathematics and in applying mathematics to practical context – *use mathematical content from levels 3 and 4 to solve problems and investigate* Level 4 ☐	• present information and results in a clear and organised way, e.g. – *organise written work, e.g. record results in order* – *begin to work in an organised way from the start* – *consider appropriate units* – *use related vocabulary accurately* Level 4 ☐	• search for a solution by trying out ideas of their own, e.g. – *check their methods and justify answers* – *identify patterns as they work and form their own generalisations/rules in words* Level 4 ☐
L3	• select the mathematics they use in a wider range of classroom activities, e.g. – *use classroom discussions to break into a problem, recognising similarities to previous work* – *put the problem into their own words* – *use mathematical content from levels 2 and 3* – *choose their own equipment appropriate to the task, including calculators* • try different approaches and find ways of overcoming difficulties that arise when they are solving problems, e.g. – *check their work and make appropriate corrections, e.g. decide that two numbers less than 100 cannot give a total more than 200 and correct the addition* – *begin to look for patterns in results as they work and use them to find other possible outcomes* Level 3 ☐	• begin to organise their work and check results, e.g. – *begin to develop own ways of recording* – *develop an organised approach as they get into recording their work on a problem* • discuss their mathematical work and begin to explain their thinking, e.g. – *use appropriate mathematical vocabulary* – *talk about their findings by referring to their written work* • use and interpret mathematical symbols and diagrams Level 3 ☐	• understand a general statement by finding particular examples that match it, e.g. – *make a generalisation with the assistance of probing questions and prompts* • review their work and reasoning, e.g. – *respond to 'What if?' questions* – *when they have solved a problem, pose a similar problem for a partner* Level 3 ☐
	Insufficient evidence ☐	Insufficient evidence ☐	Insufficient evidence ☐

Ma1 overall level Read the complete level descriptions overleaf to confirm the level. Then consider whether the level is low, secure or high.

Level 3		
low	secure	high

Level 4		
low	secure	high

The APP materials and processes will help to identify groups of children who are underperforming and will provide information about the assessment focuses (AFs) where greater progress could be made. These can be followed up, where appropriate, in more detail with individuals or groups by using the 'Example review questions' in the 'Overcoming barriers' materials. (See Section 5 for further details.) The questions provide opportunity for further exploration and discussion to more closely identify gaps.

- Are there similar gaps in learning shared by a group of pupils?

Look out for AFs where there is insufficient evidence; there may be gaps in the learning opportunities being provided.

Question level analysis

2009		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
First Name	**Surname**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
Child	A	1	1	1	N	N	1	1	1	N	N	N	1	1	1	N	N	N	N	N	N	9
Child	B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	N	1	1	N	N	17
Child	C	1	1	N	N	N	N	N	N	1	1	N	N	N	N	1	1	N	N	N	N	6
Child	D	N	N	1	1	1	1	N	N	N	N	1	1	1	N	N	N	1	N	N	N	8
Child	E	1	1	N	N	1	N	N	N	N	N	1	1	N	N	N	N	N	N	N	N	5
Child	F	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	N	N	N	17
Child	G	1	1	N	N	N	N	1	1	1	1	1	1	1	1	N	N	N	1	N	N	11
Child	H	1	1	1	1	1	1	1	1	N	N	1	1	1	1	1	N	N	1	1	N	15

- Are there common areas of mathematics that groups struggle with – in a single class, across a key stage, throughout the school?
- Are they the same children identified through analysis of different data?

It can sometimes be helpful to put the class/cohort in order of points scored and look at performance of certain groups (for example boys/girls, FSM, EAL, G&T).

We need to remember that if attainment gaps in mathematics are going to narrow, groups of children who have underperformed historically need support to accelerate their rates of progress more quickly than their peers.

Section 2: Pinpointing and narrowing the gaps in mathematics

Attitudes, aspirations, behaviour and attendance

Look out for children in mathematics lessons who lack self-confidence in mathematics, have low aspirations and readily give up.

To what extent

- do tasks given to children support decision making and independence?
- does the teaching develop a climate where children are expected to have a go?
- do all adults in the school promote self-confidence and enthusiasm for mathematics?
- are children praised excessively for relatively minor contributions or do they feel they have to earn praise?

Is it common practice for

- children to work on activities that require sustained activity?
- children with low self-confidence to work with more confident children?
- children to receive feedback on what they are good at and not so good at and why?
- discussions at pupil progress meetings to address confidence and aspirations?

Consider introducing

- pairs or small groups made up of children who lack confidence and children who are self-confident in mathematics
- activities that require children to carry out self-initiated enquiry
- guided work with groups of children with low aspirations to work on new areas of mathematics that build on what they can do while offering a new challenge.

Look out for children in mathematics lessons who are quiet, rarely make a contribution unless prompted and find it hard to make eye contact when asked a question.

To what extent

- do children have the opportunity to talk to a peer and rehearse what to say before making a contribution?
- are all children expected to explain their ideas and give reasons to a small group or to the whole class?
- are all children given time to answer questions and recognise that silence is thinking time?

Is it common practice for

- children to talk about mathematics with a peer or in a small group?
- responses from children to be organised in a way that avoids dominance by particular children?
- children to ask one another questions rather than just answer them?

Consider introducing

- prompts that children can use to answer questions
- examples of good explanations and reasoning that children can apply to other situations
- activities that ensure everyone makes a contribution, for example follow-me/loop cards.

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Look out for children in mathematics lessons who are content to carry out routine exercises but are reluctant to solve problems and take risks.

To what extent

- do children see adults and teachers demonstrate risk-taking in mathematics?
- is the teaching of routine exercises balanced with problem solving and exploration?
- are children expected to share their solutions and strategies with one another?

Is it common practice for

- children to be given incomplete/incorrect solutions that require them to adapt and correct mistakes?
- a routine question to be turned into a problem by generating with children alternative contexts and different vocabulary?
- children to be set a new problem that may require skills they don't yet have but which are then taught in the lesson after strategies and solutions have been discussed?

Consider introducing

- challenges and exploration that may require carrying out routine exercises in order to find a pattern or optimum solution
- a set of completed routines for children to identify those which are completed correctly or incorrectly
- using strategies that allow children to make decisions and take risks and acknowledge where these have been appropriately applied with varying degrees of success.

Look out for children who miss mathematics lessons and as a result make little progress because of gaps in knowledge and understanding.

To what extent

- is the progress of absent children monitored in mathematics?
- is there a support system in place to teach children who have missed work?
- is guided group work used to address gaps and barriers in mathematics?

Is it common practice for

- children who are absent to be expected to access information that tells them the work they have missed?
- school time to be used flexibly so that children who are absent can be taught the mathematics they have missed?
- mathematics work to be sent to children who are absent for sustained periods?

Consider introducing

- a simple and open record of ongoing work that children can access following a period of absence
- a display to show children how the mathematics they are learning progresses and links
- a flexible teaching assistant deployment strategy that targets support on absent children.

Notes

Mathematical knowledge and skills

Look out for children who have difficulty working mentally, for example manipulating and calculating numbers, visualising shapes.

To what extent

- are children given frequent planned opportunities to work mentally across mathematics beyond the mental and oral starter and across the wider curriculum?
- do all children have experience of using, manipulating and talking about equipment, models and images?
- do children have a rich diet of mental activity that is not just rehearsal and recall of number facts but encompasses the wider mathematics curriculum?
- is the focus on mental calculation maintained throughout the school?

Is it common practice for

- teachers to model their thinking when working mentally, for example 'How much of this can I do in my head? How could I use jottings to help?'
- teachers to ensure that children have the mental calculation strategies and understanding that underpins calculation methods before moving them on to formal methods?
- children to be regularly asked to visualise and mentally manipulate shapes and describe them to their peers?

Consider introducing

- mental mathematics within all parts of the daily mathematics lesson
- quiet time for children to stop, think, visualise and rehearse a range of mathematics mentally before being asked to talk about it or record it
- the use of ICT and non-ICT based images to help children construct their own visual images.

Look out for children who have difficulty reading and interpreting information represented in a variety of ways, for example graphs, charts and scales.

To what extent

- are children shown the same information represented in different ways?
- are children presented with information from a graph, chart or table and asked to pose questions that can be answered by interpreting the data?
- are misconceptions demonstrated and explicitly explored?

Is it common practice for

- children to read and interpret graphs, tables, charts and scales in other areas of the curriculum?
- children to be provided with a table, grid, chart, or scale and asked to work with a partner to say as much as they can about it?
- children to explore any differences in their interpretations of the same data?

Consider introducing

- real-life data in meaningful contexts that relate to children's own interests
- using graphs, charts, tables and scales across all aspects of mathematics, for example as a stimulus for oral and mental work
- sentence starters and prompts to help children to articulate their thinking.

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Look out for children who have difficulty making use of jottings and annotations.

To what extent

- do children realise that all people, including adults, can use jottings to support their understanding?
- are children given materials they can annotate rather than materials such as textbooks?
- do teachers understand the progression in the use of jottings such as number lines?
- are the usefulness of jottings and annotations discussed with the children?

Is it common practice for

- jottings to be displayed in the classroom environment, for example on working walls?
- teachers to model their own use of jottings and annotations?
- children to compare and talk about the jottings they used to solve the same problem?

Consider introducing

- opportunities within staff meetings for teachers to share examples of jottings that are used throughout the school and explore how this can be further developed
- dedicated space in children's books for jottings to show that they are valued
- mathematics displays that show examples of children's jottings.

Look out for children who have difficulty correctly interpreting questions.

To what extent

- do children discuss questions, in pairs or small groups, and then try to describe them in their own words?
- do children use role-play to act out a mathematics problem that they are struggling to make sense of?
- are children expected to check after they have answered a question that their answer makes sense in the context of the problem?

Is it common practice for

- teachers to model how they interpret and make sense of questions and the literacy skills they use to do this?
- teachers to present children with a mixed set of questions to answer so that each one needs to be interpreted?
- children to be presented with a range of questions to sort (for example into questions that can be solved using addition or subtraction) before they are asked to solve them?

Consider introducing

- a specific focus on analysing questions in guided group work with children who find this challenging
- reading and interpreting mathematics questions within literacy lessons so that children appreciate that they can use reading comprehension skills.

Notes

Mathematical processes

Look out for children who have difficulty communicating ideas and justifying arguments using mathematical symbols, diagrams, images or language.

To what extent

- do children value explaining their thinking rather than simply giving answers?
- do children realise that explanations in mathematics can be supported by the use of symbols, diagrams and images?
- can children readily access models and images and practical equipment so that they can use these to help refine and communicate their ideas?

Is it common practice for

- adults to model the process of communicating and refining their ideas to children?
- teachers to ask open questions and expect more than one-word answers?
- a variety of answers, approaches and responses to be explored so that children can decide which are the most effective and why?

Consider introducing

- sentence starters or words such as 'therefore', 'because', 'then' and 'so' that you want children to use in their replies so that they make use of the language of reasoning
- opportunities for children to rehearse and refine their explanations both before and after communicating them to others
- statements where children have to decide whether they are 'always', 'sometimes' or 'never' true and justify their choices.

Look out for children who have difficulty identifying appropriate calculation methods (mental, mental with jottings, paper and pencil or calculator).

To what extent

- is the progression mental → written → calculator seen as hierarchical and therefore written and calculator methods are seen as superior to mental methods?
- is there an emphasis in mathematics lessons on providing opportunities for children to make decisions about how to carry out calculations?
- are children expected to work independently and make their own decisions?

Is it common practice for

- children regularly to be in a position where they select their own calculation method?
- children to discuss which is the most efficient calculation method and why?
- the use, strengths and limitations of a calculator to be explored and its fitness as a method of calculation to be considered?
- children to make use of prompts to help them select an appropriate method?

Consider introducing

- lessons that begin by encouraging children to independently solve a calculation before strategies are then discussed and in which reinforcement and practice time is given
- tasks where children have to select which calculations they would complete using a given method (for example mental, mental with jottings, paper and pencil or calculator) and then discuss any differences of opinion
- the same prompts throughout the school, for example 'Can I solve this mentally? Do I need a written method? Should I use a calculator?'.

Look out for children who have difficulty persevering in a task and finding ways of overcoming difficulties.

To what extent

- do children feel that 'having a go' is encouraged and valued?
- are children asked to make sense of problems themselves before being given a step-by-step approach?
- do children have time to plan how to tackle a task before adult intervention?
- do children work on sustained activities?

Is it common practice for

- children to engage in extended tasks and to be given time to pursue enquiries on their own?
- teachers to give children time to tackle a problem and try to find ways of overcoming their own difficulties rather than intervening too quickly?
- teachers to introduce short breaks or 'mini-plenaries' during extended tasks so that the children and the teacher can both review progress?

Consider introducing

- mixed-ability groups where children help one another with a given task and share their thinking
- guided group work with groups of children who find it difficult to persevere to help them develop strategies for tackling new problems and overcoming difficulties
- regular opportunities for children to engage in extended tasks.

Look out for children who have difficulty deciding how to organise their work and check answers.

To what extent

- are children given the opportunity to decide how to present their work?
- are children taught strategies for checking work and considering the reasonableness of answers?

Is it common practice for

- children to be asked to suggest and comment on various ways of organising work?
- teachers to model systematic approaches to organising work and to explain why these approaches have been used, for example putting information into tables or looking for patterns?
- children to be given time to check their answers using a different strategy?

Consider introducing

- displays of children's work showing a range of organisational approaches along with explanations about why the organisation was chosen
- allocated and planned time for children to check one or two answers and to share the approaches they used
- activities that involve spotting and correcting errors.

Notes

Language

Look out for children who only provide short or one-word answers.

To what extent

- are children asked to provide answers that focus not only on what they did, but how they did it and why?
- are children encouraged to listen to others and then comment on whether they agree and explain why/why not?

Is it common practice for

- teachers to give children 'thinking time' before asking for responses to questions?
- teachers to give children sufficient time to formulate and then refine explanations?
- teachers to give children time and space to answer questions rather than 'second-guessing' their response when they are hesitant and finishing off the response?
- children to be asked whether they have anything to add to a response?
- teachers to use assessment questions in the Primary Framework to encourage children to provide fuller responses?

Consider introducing

- language prompts to help children to express their reasoning (for example, if… then… because…)
- more open questioning and thinking time before children are asked to respond
- at specified times, the expectation that children give answers to questions in complete sentences.

Look out for children who are learning English as an additional language, where English is holding back their progress in mathematics.

To what extent

- are children expected to regularly use and rehearse the correct vocabulary in a variety of contexts?
- do teachers make effective use of models and images to help children to make sense of the mathematics and the language used?
- do teachers model precise mathematical language and vocabulary in their own explanations and descriptions?

Is it common practice for

- vocabulary and appropriate images to be displayed, interactively in the classroom, in different languages where appropriate?
- teachers to provide helpful models of spoken English and opportunities for careful listening, oral exchange and supportive, shared repetition?
- teachers to recast or remodel a child's response when their use of language is not accurate?

Consider introducing

- interactive language and vocabulary displays (not just lists of words in a unit)
- sentence starters to help children to make precise use of mathematics language and vocabulary
- mathematics activities for children to take home in their home language.

Look out for children who have language difficulties that affect their ability to understand and make use of instruction and their ability to encode and represent mathematical information.

To what extent

- is children's language built on and more precise vocabulary introduced as appropriate?
- are children expected to use demonstration alongside their explanation (for example with jottings, on a number line or other resources)?
- are children' s explanations viewed as helpful to others and is listening emphasised as a key skill in mathematics?

Is it common practice for

- children to be given opportunities to discuss given tasks with their peers in order to establish a shared understanding of expectations?
- teachers to make use of number lines, number apparatus, diagrams, pictures and graphs to illustrate meaning as well as games and puzzles where the rules can be picked up quickly by watching a demonstration?
- teachers to use mathematical dictionaries with whole groups and guided groups?

Consider introducing

- a learning environment with vocabulary displayed, illustrating meaning using examples, non-examples, models and images where appropriate
- strategies in mathematics lessons that already work for developing speaking and listening skills in other areas of learning.

Look out for children who have difficulty discussing their work and articulating their ideas and thoughts.

To what extent

- are sufficient opportunities provided for children to talk rather than teachers dominating classroom talk?
- do children have opportunity to talk independently of an adult, in pairs or small groups, where the focus and outcome are clear?
- is guided group work used to encourage children to describe their thinking?
- is talk seen as more than simply rehearsal of vocabulary?

Is it common practice for

- children to be given time to reflect on their mathematics learning and to talk about it with others?
- adults to engage in good-quality dialogue with children?
- discussion to be used to help develop children's logic, reasoning and deduction skills?
- guided group work to be used to introduce the mathematical language needed to explain, refine and evaluate their own work and that of others?

Consider introducing

- models for talking, for example tell yourself, tell a friend, tell a penfriend (recording), convince a teacher
- opportunities for children to work in pairs, rehearsing their explanations and thinking before speaking to the whole group or class.

Notes

Fit for purpose pedagogy

Look out for insufficient use of guided group work in mathematics that is targeted at meeting the needs of specific groups of children.

To what extent

- is the purpose of guided group work well understood by teachers in the school?
- are children grouped flexibly within mathematics according to identified needs?
- are children able to work independently so that teachers can spend sustained time with a group of children?

Is it common practice for

- guided group work to be informed by detailed assessment of particular children's learning and opportunities to be provided for further assessment?
- children to be grouped according to shared and current learning needs?
- teachers to have a very clear role in scaffolding and supporting learning when working with a group?
- children's reasoning and communication skills to be developed through guided group work?

Consider introducing

- strategies to develop children's independence in mathematics so that teachers can work intensively with a group of children
- lesson study as an approach to help develop effective guided group work throughout the school.

Look out for mathematics lessons with little opportunity for discussion as a whole class, in groups and in pairs.

To what extent

- do teachers ask open questions that provide the opportunities for sustained talk?
- do children understand that they learn by talking about the mathematics they are engaged in?
- are the purpose and outcome of a discussion made clear to children?
- do teachers plan opportunities for children to develop thinking through cycles of activity followed by discussion? Does this happen for pairs, groups and the whole class?

Is it common practice for

- all children to be given a clear role when participating in group discussion?
- children to be given time to rehearse what they are going to say to the whole class or to a group?
- teachers to talk to children about how discussion has supported learning?

Consider introducing

- opportunities for children to ask their own questions
- flexible groupings so that talk partners are changed.

Look out for insufficient opportunity for children to work independently and think for themselves.

To what extent

- do teachers see the need for a balance of supported and independent work, both individually and in groups?
- is independent work used as opportunity for children to think for themselves and to engage in child-initiated enquiry?
- is there a shared understanding of the types of activities and enquiries that could engage children in independent thinking?

Is it common practice for

- independent work to provide opportunities for children to carry out enquiry and then feed back to others?
- independent work to be varied and not always from a workbook or textbook?
- independent group work to be organised so that groups are clear about the task set and know how to work as a group independently of adults?

Consider introducing

- flexible groupings so that children have opportunity to work in different groups
- whole school strategies to develop children's independence in mathematics.

Look out for planned learning opportunities not being adjusted in the light of assessment information.

To what extent

- do teachers reflect on the impact of their teaching and adjust lessons and learning across a sequence of learning?
- is feedback on learning shared with children in a way that engages them and helps them to move on?
- are effective cues (visual, aural, prompts and discussions) used to engage children in recognising what they already know?
- do teachers make use of the prior learning sections and assessment questions in the Primary Framework to help to inform planning?

Is it common practice for

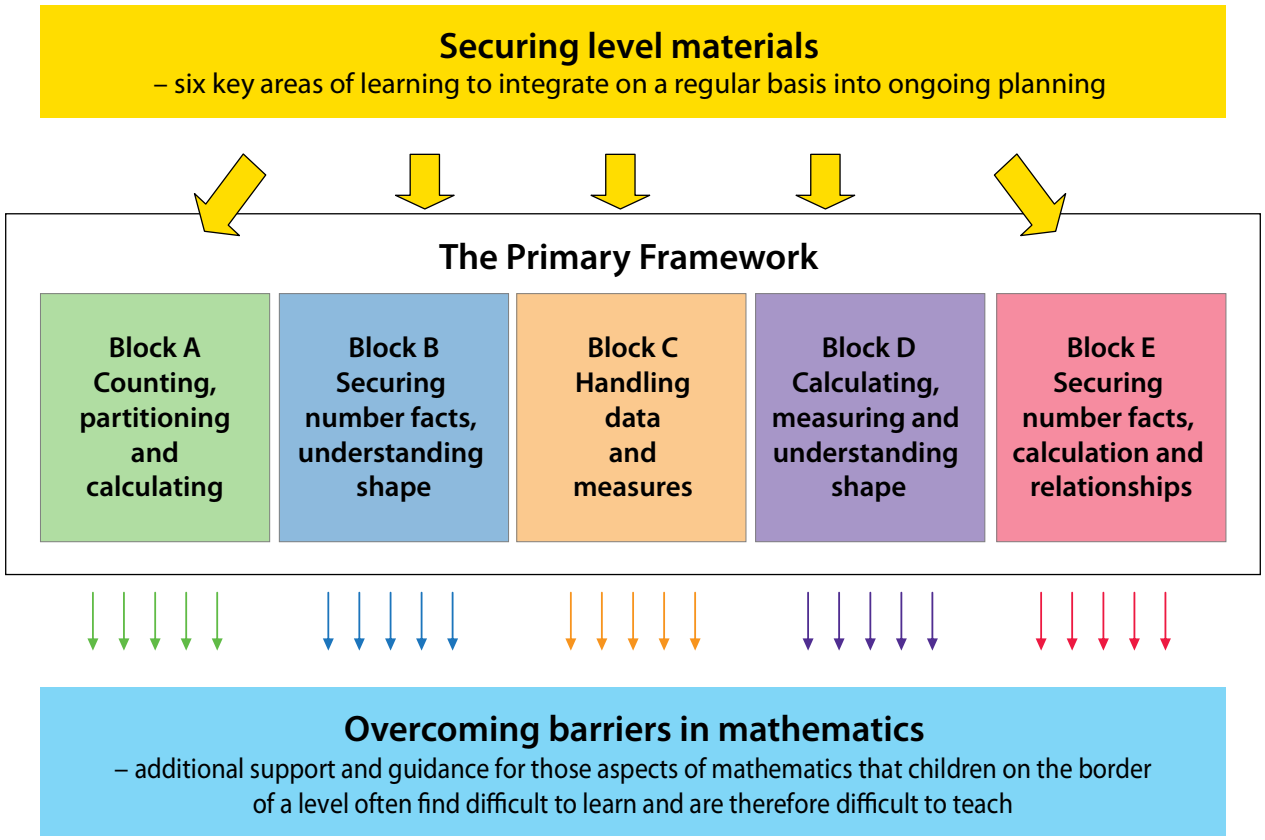
- misunderstandings and misconceptions to be picked up and either dealt with immediately or addressed in future planning?
- assessment information to be used to inform target setting and teaching approaches?
- lesson plans to be adapted where children aren't making the progress expected?
- teachers to highlight assessment opportunities across the teaching and learning cycle?

Consider introducing

- planned time for teachers to talk about and reflect upon changes and modifications that they have made to planning and teaching approaches
- pre-teaching at the beginning of a unit.

Notes

Using *'Overcoming barriers in mathematics'* and *'Securing levels in mathematics'*



The majority of Section 2 offers questions around five aspects of learning mathematics, which will help mathematics subject leaders and class teachers to identify where classroom and school practice could be developed in order to help children make better progress. Teachers should also be making use of the Overcoming barriers and Securing level materials.

Securing levels in mathematics (for levels 1, 2, 3, 4 and 5)

These guidance materials identify key areas of learning that children need to secure as they progress through school. While teachers will integrate the ideas from the materials into their ongoing planning, they can also be used to plan targeted support for particular groups of children. They set out standards to be achieved and suggest teaching approaches, relevant intervention materials, teaching and learning resources, and assessment prompts.

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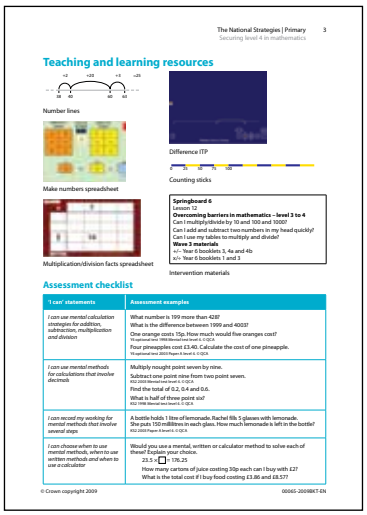
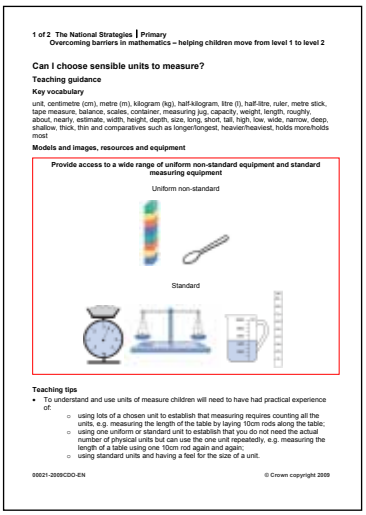
Overcoming barriers in mathematics

The Overcoming barriers materials address key areas of mathematics that children working at the border of a level often find challenging – the areas in which children need additional support to help them maintain progress.

- **Levels 1 to 2, levels 2 to 3, levels 3 to 4:** These materials have been designed to help teachers ensure that children progress through the levels expected for their age. The materials provide teaching resources and ideas upon which teachers can draw when planning additional support for those children who are experiencing barriers in their learning that slow or block their progress. Teachers will find the materials useful when planning their teaching to help children working around the level borders make good progress
- **Levels 4 to 5 (available in spring term 2010):** These materials aim to support teachers in planning learning opportunities for those children around level 4/5. These children would largely come from the group who achieve level 3 at the end of Key Stage 1 and so are expected to achieve level 5 at the end of Key Stage 2. However, a significant number of children do not make two levels of progress. There are other children who achieve high level 2 at the end of Key Stage 1, make excellent progress, become on track to achieve level 5 but progress slows despite the potential to achieve level 5.

Publication details are in Section 5 of this booklet.





Section 3: Sustaining impact

To know whether actions are having sustained impact and children are making the progress we expect, careful and ongoing monitoring and evaluation are required. Information from this process will help to determine which actions to continue with, adapt, replace or strengthen. It will help to make adjustments to target groups and to undertake a review of the mathematics being taught.

Sustaining impact on narrowing gaps in the learning of mathematics will involve:

- analysis and use of day-to-day, periodic and transitional assessment
- close tracking of the progress made by focus groups of children
- revising and setting of new targets as appropriate
- maintaining a focus on children's progress in overcoming gaps and ensuring that new gaps are not emerging
- maintaining appropriate challenges for all children
- identifying the strategies and actions or approaches that are making a difference to children's learning and building on those
- identifying the strategies that are not making a difference and deciding what needs doing differently.

Using **pupil tracking data** is essential to the monitoring of progress. The data provides a check on the progress of individual children and groups and can be shared, discussed and acted on at all levels across the school, including the senior management team. The actions that have been taken and implemented can be reviewed with colleagues, drawing on the tracking and assessment data for evidence of impact.

Holding **pupil progress meetings** can help to maintain and sustain improvement. These meetings allow children's progress to be discussed and ways of helping children to overcome existing barriers can be planned. They should address progress across a range of aspects of mathematics learning, including confidence and aspirations. The meetings give opportunity for mathematics subject leaders to gain an overview of the progress in mathematics of targeted individuals and groups. Mathematics subject leaders bring their overview of key areas of mathematics that have been identified as weaknesses throughout the school and can use the meetings to monitor progress in these areas and to make informed decisions about the whole-school focuses for teaching and learning. The meetings also provide opportunity to identify children whose progress has recently stalled or slowed, and those children who no longer require support – a time to review membership of the focus groups.

Schools are increasingly holding pupil progress meetings for the class teacher and senior leadership team, including the mathematics subject leader.

Analysing **APP outcomes** generates high-quality information that identifies children's progress against mathematics AFs. This information can be used to evaluate progress and to inform feedback to children and parents/carers.

Over the longer term, it is important to continue to review **current data that corresponds to those you looked at in Section 1** which led you to identify groups of underperforming children. Address the questions:

- Are children in the focus group making expected progress and is there evidence of significant improvement in their learning and attainment?
- Are the identified gaps narrowing, what is working well and what needs changing?
- Are there children not in the focus groups whose progress is slow or has stalled and who need additional support?

Look again at the **aspects set out in Section 2** that enabled you to identify key areas for development. Use your classroom visits and conversations with children and adults to reflect on any evidence of changes you observe. Evaluate the effect of actions and make informed decisions about further actions to improve or sustain impact.

Talk with children. Getting feedback from children engages them in the process and helps in the evaluation of impact on their learning of mathematics. Discuss with children the progress they have made, what has helped them to make it, what they need to do next, and how this might be implemented.

Talk with parents/carers. Engaging parents or carers in regular discussions about their child's progress provides another perspective on attainment and learning and may lead to additional out-of-school support for a child. Some parents/carers find it difficult to support their child's mathematics learning, but having a dialogue about what progress they are making and why they are making it helps parents/carers to feel involved and supportive. For a child, knowing that their teacher and their parents/carers are talking about their progress in mathematics can boost confidence and help to initiate further dialogue. If take-home activities have been set up, these can form common ground for discussion.

Holding **discussions with colleagues** supports the evaluation of the effectiveness of practices in the school. Plan discussions with the whole staff to encourage colleagues feeding back on which actions have been successful and why it helped to widen the use of effective practice. This supports the provision of quality first teaching of mathematics in the school. Knowing what has worked well and why will provide a good basis on which to build to ensure that the needs of all learners can be met and gaps are less likely to appear.

Section 4: Celebrating success

- **Share success with children**

  Involve children in identifying their success and working with them to understand how it has been achieved. Help them to see what they need to do next, building on successful learning approaches.

- **Share success with parents and governors**

  Make clear what progress has been made and explain the things that made the difference. Encourage parents to take a keen interest in continued progress and help them to see how they might support their children's learning. It is important that governors know which groups of children have been targeted, what success they have met and how it has been achieved.

- **Share success through the school**

  If successful practice in narrowing the gaps has been identified

  – **in one aspect/area of mathematics**, consider how other aspects/areas might benefit from similar approaches and actions

  – **with one group**, reflect on the steps taken to make the difference and adopt and adapt for working with other groups

  – **in one class**, help to share practice across the school; it should be systematic and organised and could be shared by using a lesson study approach or other form of classroom-based collaborative partnership

  – **in mathematics across the school**, reflect on how the actions and approaches can be used to narrow the gaps in other areas of learning.

- **Share success with other schools**

  This can be done through networks, local mathematics subject leader meetings, through the work of leading teachers, via school improvement partners and so on.

  Write a case study for 'What Works Well' so that your success can be shared nationwide and accessed by a large number of professional colleagues.

  www.whatworkswell.standards.dcsf.gov.uk

- **Share success with your self-evaluation form (SEF)**

  Success can be recorded in a variety of ways and one of those should be your SEF.

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Section 5: Supporting materials

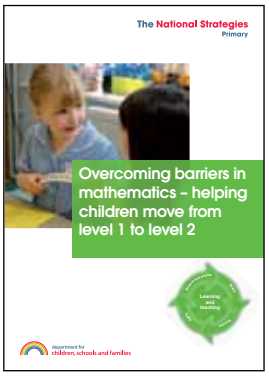
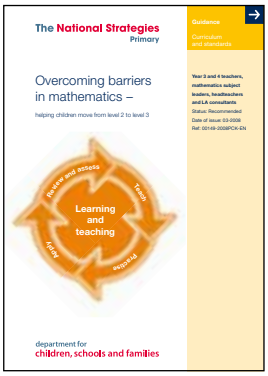
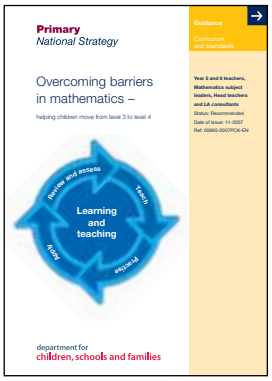
Mathematics – National Strategies' resources

All of the following National Strategies' resources can be found at **www.standards.dcsf.gov.uk/nationalstrategies**

Search for them using their reference number.

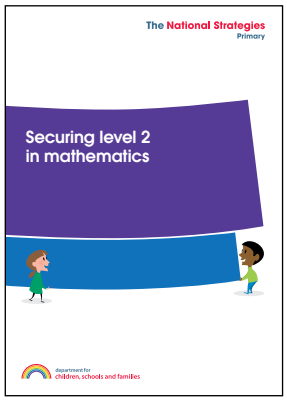
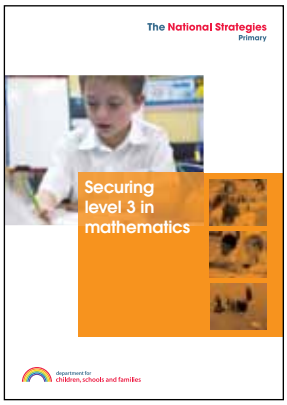
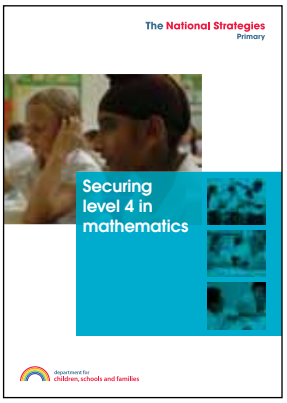
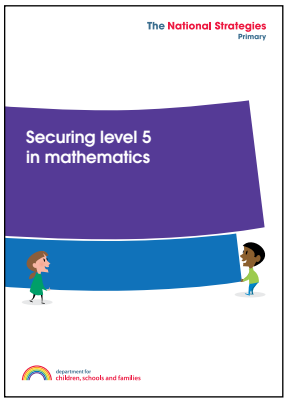
Overcoming barriers

These materials provide teaching resources and ideas upon which you can draw when planning additional support for those children who meet barriers in their learning that slow or block progress.

			Due to be published in spring 2010
Overcoming barriers in mathematics – helping children move from level 1 to level 2 Ref: 00021-2009 BKT-EN	*Overcoming barriers in mathematics – helping children move from level 2 to level 3* Ref: 00149-2008 PCK-EN	*Overcoming barriers in mathematics – helping children move from level 3 to level 4* Ref: 00695-2007 PCK-EN	*Overcoming barriers in mathematics – helping children move from level 4 to level 5* Ref: 00904-2009 BKT-EN

Securing levels

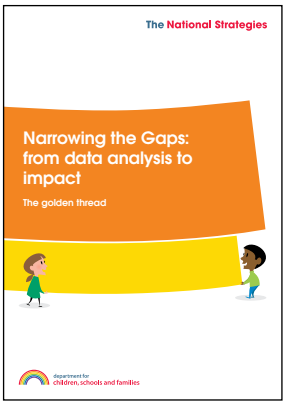
The Securing level booklets identify six key areas of learning that children need to secure to attain a given level in mathematics. The accompanying What I can do in mathematics booklets help to engage children in assessing their progress in mathematics. They include assessment questions that can be used for discussion with and completion by children as they develop their confidence. Individual pages or the whole booklet can be sent home to show parents or carers what their child can do.

			
Securing level 2 in mathematics Ref: 00687-2009 BKT-EN	*Securing level 3 in mathematics* Ref: 00388-2009 BKT-EN	*Securing level 4 in mathematics* Ref: 00065-2009 BKT-EN	*Securing level 5 in mathematics* Ref: 00866-2009 BKT-EN

Securing level 1 in mathematics is due to be published in spring 2010.

What I can do in mathematics: level 2 Ref: 00952-2009 DOC-EN-01	*What I can do in mathematics: level 3* Ref: 00952-2009 DOC-EN-02	*What I can do in mathematics: level 4* Ref: 00952-2009 DOC-EN-03	*What I can do in mathematics: level 5* Ref: 00952-2009 DOC-EN-04

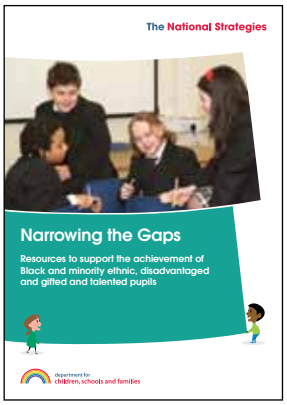
Narrowing the Gaps



Narrowing the Gaps: from data analysis to impact – the golden thread

Note: This publication contains a case study for primary mathematics

Ref: 00792-2009PDF-EN-01



Narrowing the Gaps: Resources to support the achievement of Black and minority ethnic, disadvantaged and gifted and talented pupils

Ref: 00781-2009BKT-EN

Narrowing the Gaps: A priority for national, local and school action

Ref: 00912-2009PDF-EN-07

Other publications

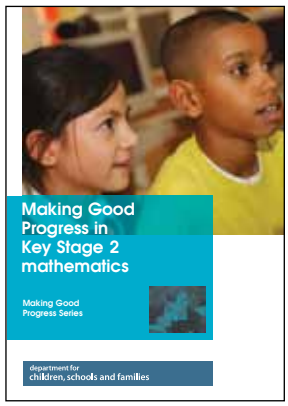
Making Good Progress series

Making Great Progress – Schools with outstanding rates of progression in Key Stage 2

Ref: 00443-2007BKT-EN

Keeping up – Pupils who fall behind in Key Stage 2

Ref: 00442-2007BKT-EN



Making Good Progress in Key Stage 2 mathematics

Ref: 00948-2008BKT-EN

- *The Improving Schools Programme Handbook*
  Ref: 00314-2009BKT-EN
- *Breaking the link between disadvantage and low attainment: Everyone's business*
  www.publications.teachernet.gov.uk
  Ref: DCSF-00357-2009
- Helping children with mathematics: Year 5 to Year 6
  Teaching resources designed to help parents support children with learning mathematics, towards the end of Year 5 or the start of Year 6. Includes practical real-life activities with examples which can greatly enhance a child's learning.
  www.standards.dcsf.gov.uk/nationalstrategies/node/88705
- PDM 2: Improving pace and progression for underperforming groups
  www.standards.dcsf.gov.uk/nationalstrategies/node/46418
- PDM 3: Strengthening pedagogy for underperforming groups
  www.standards.dcsf.gov.uk/nationalstrategies/node/46561
- *'Narrowing the Gaps: from data analysis to impact – a practical guide'*
  www.standards.dcsf.gov.uk/nationalstrategies and search the publication using DCSF reference 00912-2009PDF-EN-07
- Primary Mathematics Framework
  www.standards.dcsf.gov.uk/nationalstrategies/primary/primaryframework/mathematicsframework
- Assessing Pupils' Progress
  www.standards.dcsf.gov.uk/nationalstrategies/primary/assessment/assessingpupilsprogressapp

Ofsted

Mathematics: understanding the score – Improving practice in mathematics teaching at primary level
This 16-page booklet illustrates through practical examples how teachers can make teaching more engaging and develop pupils' skills whatever their ability.

Available to download from **www.ofsted.gov.uk**
Ref: 070063

Audience: Mathematics subject leaders, class teachers, headteachers, deputy headteachers and local authority consultants.
Date of issue: 12-2009
Ref: **01082-2009BKT-EN**

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