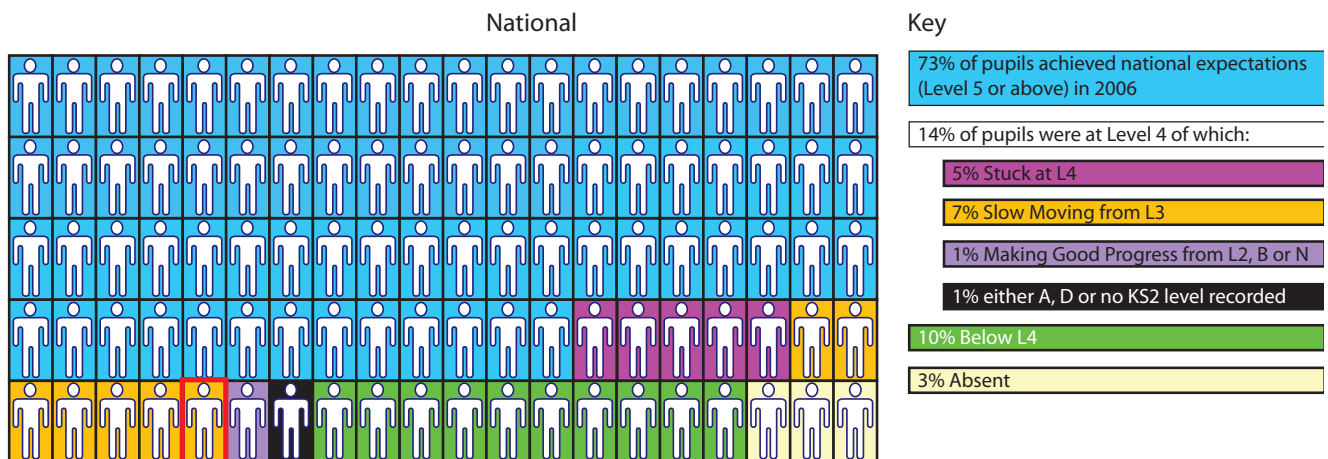


Accelerating the progress of pupils at Key Stage 3 in English, mathematics and science

(Improving pupil progression from Level 3 to Level 5)

Making Good Progress Series

department for
children, schools and families



The pupil progression chart is a powerful tool that can be used to represent the proportion of pupils who are meeting the national expectation at the end of the key stage, as well as the proportion who do not.

Crucially the chart highlights the proportion of pupils achieving particular progression trajectories during the key stage. Each 'stick person' represents 1% of the pupil cohort in Year 9. In the charts used throughout this report:

- Blue represent pupils who reached national expectations (Level 5).

The rest of the colours represent those who did not reach national expectations.

- Pink represents those pupils who achieved Level 4 at Key Stage 2 but have not progressed since.
- Yellow represents those pupils who achieved Level 3 at Key Stage 2 but did not reach national expectations (Level 5) at Key Stage 3.
- Purple represents those pupils who have made good progress to Level 4.
- Black represents those pupils who achieved Level 4 but have no prior attainment record from Key Stage 2.
- Green represents those pupils who are two levels or more below national expectations.

This report focuses on a group of pupils who started Key Stage 3 at Level 3 but in Year 8 and 9 were judged to be at risk of not achieving Level 5 at the end of the key stage.

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1 Introduction

The proportion of pupils achieving Level 5 in English, mathematics and science at the end of Key Stage 3 has increased significantly since these subjects became a focus of the Key Stage 3 National Strategy. The improvements are shown in the table below:

| Subject | % Level 5+ (benchmark data) | % Level 5+ (2006) |
|----------------|------------------------------------|--------------------------|
| English | 57% (1997) | 73% |
| Mathematics | 60% (1997) | 77% |
| Science | 59% (1998) | 72% |

However, even with equal access and despite everyone's best efforts, pupils do not proceed or progress at the same rates. The 'conversion rates' in 2006 for pupils who entered Key Stage 3 with a Level 3 and achieved a Level 5 or better at the end of the key stage in each of the core subjects are shown in the table below:

| Subject | Conversion rate (Level 3 to Level 5+) 2006 |
|----------------|---|
| English | 34% |
| Mathematics | 41% |
| Science | 11% |

This report presents the issues arising from a small scale investigation focusing on pupils who are at risk of not converting a Level 3 in English, mathematics or science at Key Stage 2 into a Level 5 at the end of Key Stage 3.

42 schools were selected on the basis of Key Stage 2 to Key Stage 3 conversion rates in 2006 (19 for English, 13 for mathematics and 10 for science). There was a reasonable balance between shire, London and unitary local authorities.

Each school was visited for up to a day by a DCSF school standards adviser. The methodology of the investigation was based on a series of detailed interviews with Year 8 and Year 9 pupils (identified by the schools as 'at risk' of not adding two levels during the key stage), the headteacher and a senior leader with responsibility for pupil tracking, Year 8 and Year 9 teachers and the relevant subject leader. In addition, some samples of pupils' work and teaching plans were examined. Lessons were not observed.

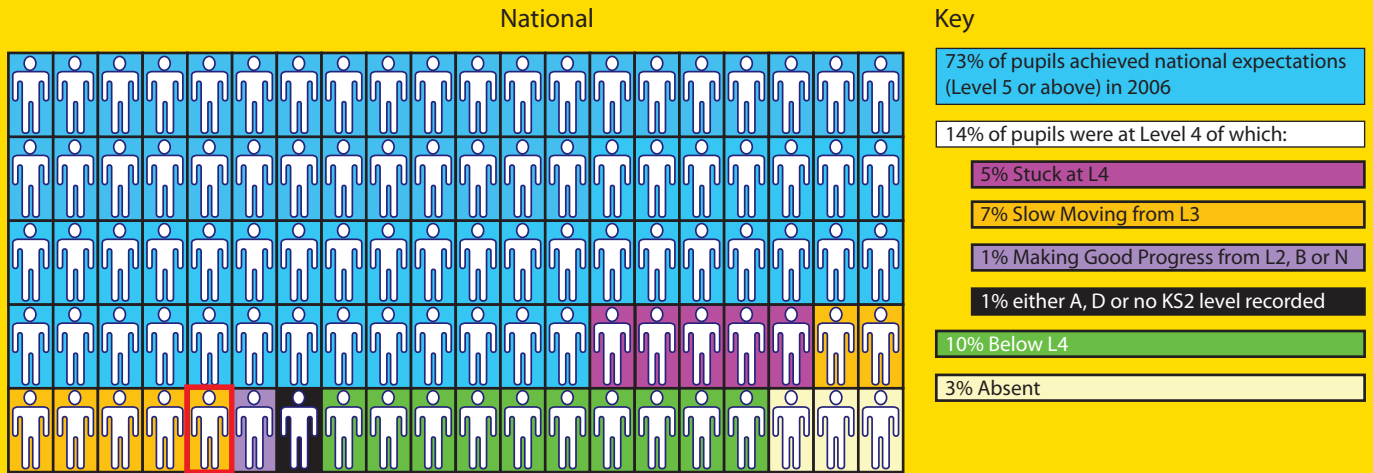
The report focuses on the experiences of approximately 285 pupils in the schools visited. It is split into separate chapters on how to identify those making slow progress in English, mathematics

and science. Along with common characteristics it also outlines some significant differences – particularly between boys and girls.

Based on these research findings, the report also includes practical suggestions for schools and teachers on how they can improve the progress made by these pupils.

Pupil Progression Chart – KS3 English (2006)

Yellow represents those pupils who entered the key stage at Level 3 and have made progress to Level 4 by the end of the key stage. Within the green category will be some pupils who entered the key stage at Level 3 and remained at that level throughout the key stage.



Chapter 2:

Identifying slow moving pupils in English in KS3

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| Specific issues arising | 7 |
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2 Identifying slow moving pupils in English in KS3

The main findings from the investigation are grouped into three separate sections: the pupil characteristics, a summary of the specific issues arising and other significant findings.

Pupil characteristics

“They just know that they don’t find things easy – it’s a bit like being in a fog. Some of them do a good cover-up job.” (Year 8 teacher)

“Level 4 means you’re not good at English.” (Year 8 boy)

“I would understand if my teacher sat with me and explained individually.” (Year 9 girl)

“They are the grey children – they are slipping through the net.” (Subject leader)

- They were pleasant, good natured pupils who enjoyed school, liked their teachers and were happy to talk about their learning in English
- They were not actively disruptive although they could be slow to settle in lessons and occasionally engaged in low level disruption. They admitted that they sometimes chose when to work and their engagement in a lesson could depend on their mood
- The boys had short attention spans and tended to rush their work whereas the girls were quieter and could be overlooked in lessons, preferring “time out” to reflect before answering a question
- They struggled with personal organisation, tending to lose work, books and folders which teachers sometimes saw as avoidance tactics
- They did not respond well to tests or to working under timed conditions
- They preferred learning that was visual, practical and active and they could respond creatively and imaginatively to work of this nature
- They appreciated praise and positive incentives such as “good work” postcards and letters sent home
- They preferred short, focused activities and found it helpful when their work was broken into “chunks”
- They appreciated an element of fun in their learning, such as word games.
- They valued clear explanations
- They spoke warmly of the support they received from teaching assistants and appreciated opportunities to work with more able pupils

- They lacked the confidence and the strategies to work independently, avoided risks and tended to be reliant on small group or one-to one adult support
- They knew they were struggling in English. Some pupils felt embarrassed about this and were very conscious of being treated differently from other pupils, for example, when withdrawn from lessons for additional support. However, for the most part, they seemed to accept that they were working below the level of many of their peers

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Specific issues arising

Pupils' own comments, together with evidence provided by their teachers and senior leaders, suggested the following:

In reading

- They enjoyed lightweight fiction and magazines and often read at home for pleasure as it meant they could read what they liked. However, they didn't always regard this as valid reading. Some teachers regarded it as 'comfort reading' and were concerned about its impact on pupils' writing.
- They were self conscious about reading aloud in front of their peers, as they sometimes stumbled over unfamiliar words, preferring, on the whole, to read to themselves. Some pupils said that they found it boring to listen to other pupils read.
- They enjoyed watching the film of the book although one boy said that he preferred the book (of *Stormbreaker*) to the film as "in the book you can imagine what happens".

- They enjoyed the practical and interactive nature of drama lessons and the Year 9 pupils had enjoyed studying Shakespeare.

"I lose concentration and have to put my finger under the words. I don't like doing that. I never stay with a book." (Year 8 girl)

"When I read to myself, I read loads more and faster." (Year 8 boy)

"I liked it when we watched *Holes* after we read the book. I could see it in my head." (Year 8 boy)

In writing

- They lacked a feel for the overall shape of a sentence, often losing track of the ending part way through. Some pupils felt that they repeated themselves unnecessarily as a result. This was often a result of not reading back their writing to themselves during the composition process.
- Many pupils cited difficulty with punctuation and sentence structure. They said that they were often too busy writing to remember about punctuation and tended to rely on their limited editing and proofreading skills to scan for errors retrospectively.
- Paragraph structure was insecure and pupils had difficulty clustering and developing their ideas within a paragraph, often resulting in short, one sentence paragraphs in their writing.
- Pupils would write at length when they could relate to a topic and some said that they wrote stories at home. They preferred narrative to non-narrative writing. Although they saw writing as a means of personal expression, they lacked the sense of writing for a wider readership.
- Some teachers believed that the informal style of pupils' personal reading diets pervaded their writing in school, making it inappropriately colloquial when the task required a more formal style. Both pupils and teachers were concerned that the language of texting and e-mail sometimes crept inappropriately into their writing when a more formal genre was required.
- Attitudes to planning were mixed: some pupils were highly aware of the value of planning and could describe different models whilst other pupils said that planning was just an extra job which got in the way of their writing.
- Guided writing was not established practice, largely because these pupils were not considered sufficiently independent to be left to work on their own. When it did take place, the guided session tended to be led by the teaching assistant whilst the teacher supported the whole class.

"When I write a sentence, it goes on for quite a while. I thought it's too long." (Year 8 girl)

"I don't use full stops and capital letters...it's faster to write without them and then put them in after." (Year 8 girl)

"I'm at a loss as to what to do with a child who can't write a sentence." (Year 8 teacher)

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In speaking and listening

- Pupils often displayed good oral skills and could articulate and share their well developed ideas. However, their talk often lacked formality and a wider awareness of audience and did not always translate into improved outcomes in their writing.
- Teachers said that whereas they planned speaking and listening activities into their lessons, they rarely modelled speaking and listening explicitly. Even though they considered speaking and listening to be key for these pupils, they felt that they did not teach these skills in the same way as reading or writing.

“It’s one of those things that’s not taught as well as it could be. We don’t actually model it but we do oral activities.” (Subject leader)

Other significant findings

Intervention and progression

“Withdrawal made me feel like I wasn’t good enough to be with the others.” (Year 8 boy)

“I rush my work which I must stop doing. It has to be finished – I don’t want to be behind.”
(Year 8 girl)

“If you’re in the bottom group, the teacher takes longer to tell you things because he thinks you need more time. He makes it easy. I think I need more challenge.” (Year 9 boy)

- Many pupils had received intervention support in the form of Literacy Progress Units and many had made good progress during the units. However, there was little evidence that their gains were maintained over time and their progress was rarely monitored or tracked once the programme had finished. Furthermore, there was very little awareness of the primary school intervention programmes which these pupils had received earlier in their school careers.
- Pupils didn’t readily transfer their learning from intervention sessions to English lessons or to other lessons across the curriculum. This seemed to be largely a result of the fact that this additional support was rarely integrated into the English curriculum and English teachers were often unaware of the actual support pupils had received. Support was sometimes delivered by Learning Support Assistants (LSAs) within the SEN team.
- It was widely felt that literacy across the curriculum had not maintained its momentum and a number of schools had decided to renew their focus on this in order to embed and apply pupils’ literacy skills across the curriculum. In one school, extra non-contact time for English teachers was being used to provide in-class support for the transfer of pupils’ literacy skills in other subjects.
- Year 9 booster sessions were generally established but were often delivered after school which meant that target pupils did not always attend. In some schools, Easter booster classes had proved popular.
- Several schools were offering an integrated curriculum for Level 3 pupils in Year 7 whereby pupils were taught by a smaller number of teachers, enabling them to integrate teaching and learning across a number of subjects, for example, in English, humanities and modern foreign languages. Often there was a greater emphasis on basic skills in these classes. One school had employed teachers with primary expertise to teach these Year 7 groups.
- Some schools considered smaller teaching groups to be a more beneficial way of supporting pupils than the delivery of additional intervention programmes. However, some teachers were concerned that a small bottom set provided pupils with poor language models and expressed a preference for smaller groups throughout the school.

- Senior leaders tended to have higher expectations for progression than some subject teachers although, on the whole, there seemed to be an acceptance that a good proportion of pupils entering key stage 3 at Level 3 in English would not progress by two levels over the key stage. Many teachers felt that these pupils had been struggling to catch up ever since primary school. For several schools, the visit had prompted senior leaders to look at their conversion data in order to identify stuck and slow moving pupils.

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Assessment, target-setting and tracking

"I never read what my teacher writes because it's always the same." (Year 8 boy)

"I like peer assessment as it helps you see your mistakes. I can't do it myself." (Year 9 boy)

- Most pupils knew their numerical target and they understood the significance of Level 5. However, very few pupils knew how to attain Level 5 and the majority offered suggestions such as, "Try your hardest," or "Study and do your homework." Some pupils were expected to select their own targets from a statement bank. Many targets were unspecific, such as, "Paragraphs," or low level, such as, "Get my spelling better," or "Improve presentation." In several schools, form tutors were expected to agree and manage pupil targets. However, when pupils were subsequently required to discuss these targets with their subject teachers, they rarely did so.
- Teachers generally provided written feedback on pupils' work but this was usually task specific and therefore it was often difficult to relate it to future work. The target-getting process was considered unmanageable by many teachers as they would often set a different target each time a piece of work was marked.

- Pupils showed little engagement with written teacher feedback. Some said that they looked at the level but didn't read the comment if the level was disappointing. Pupils were given little time to reflect and act on their teachers' comments although several said that they liked written feedback as they could return to it later.
- Tracking at departmental level did not always meet senior leadership expectations of an overall English level on a termly basis. Most departments assessed reading, writing and speaking and listening separately which meant that tracking was uneven over the course of a year. Some departments were moving towards a termly overall judgement, incorporating reading and writing, often facilitated by the Assessing Pupils' Progress (APP) materials. Developing practice in APP was beginning to have a positive impact in many schools on teachers' understanding of National Curriculum levels and progression from one level to the next.
- There was little evidence of the impact of assessment for learning, although peer assessment was considered by pupils to be more helpful than self assessment as they found it easier to identify other pupils' errors than their own.
- Most pupils were very aware of being in lower ability sets, even when these had a positive name such as the "express" group. Many pupils liked these smaller groups as they felt secure and supported by their peers but some did not feel sufficiently challenged by the work. Many of those pupils who were taught in mixed ability groups found it hard to keep up with the pace and either left work unfinished or rushed it in order to complete it.
- Some schools had adopted special assessment books for specific pieces of work which emphasised independence and application. Success criteria and individual targets were shared with pupils prior to completion of this work, much of which was of a good quality and demonstrated a high level of challenge for these pupils.

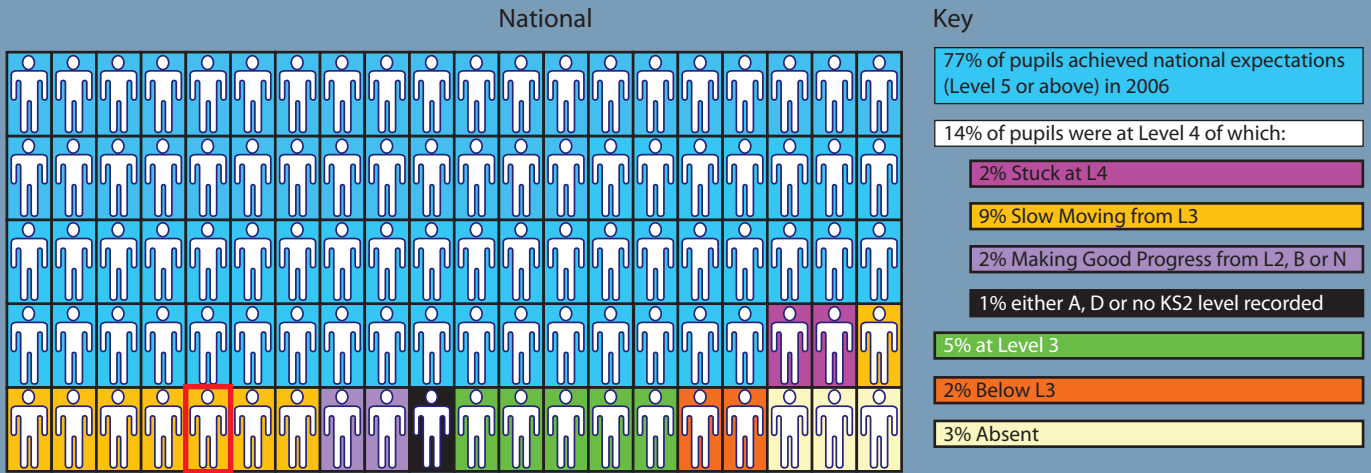
Parents and carers

"If you get help, then it's not your work." (Year 9 boy)

- Parental support was variable with some pupils citing highly supportive parents as well as helpful support from older siblings and grandparents although some pupils clearly came from more vulnerable home environments. Some pupils preferred not to ask for help at home as they were worried that their work might not be sufficiently independent if their parents helped them.
- Many schools were developing imaginative strategies to engage and support their parents. Some schools had adopted extended homework pieces which were completed on a half termly basis. Pupils were provided with a range of support, such as success criteria, a parental help sheet and support sessions prior to completion. Schools reported that this practice had developed pupils' independence as well as improving the quality of their homework.
- Irregular attendance was cited by some teachers as a barrier to progress for some of these pupils.

Pupil Progression Chart – KS3 Maths (2006)

Yellow represents those pupils who entered the key stage at Level 3 and have made progress to Level 4 by the end of the key stage. Within the green category will be some pupils who entered the key stage at Level 3 and remained at that level throughout the key stage.



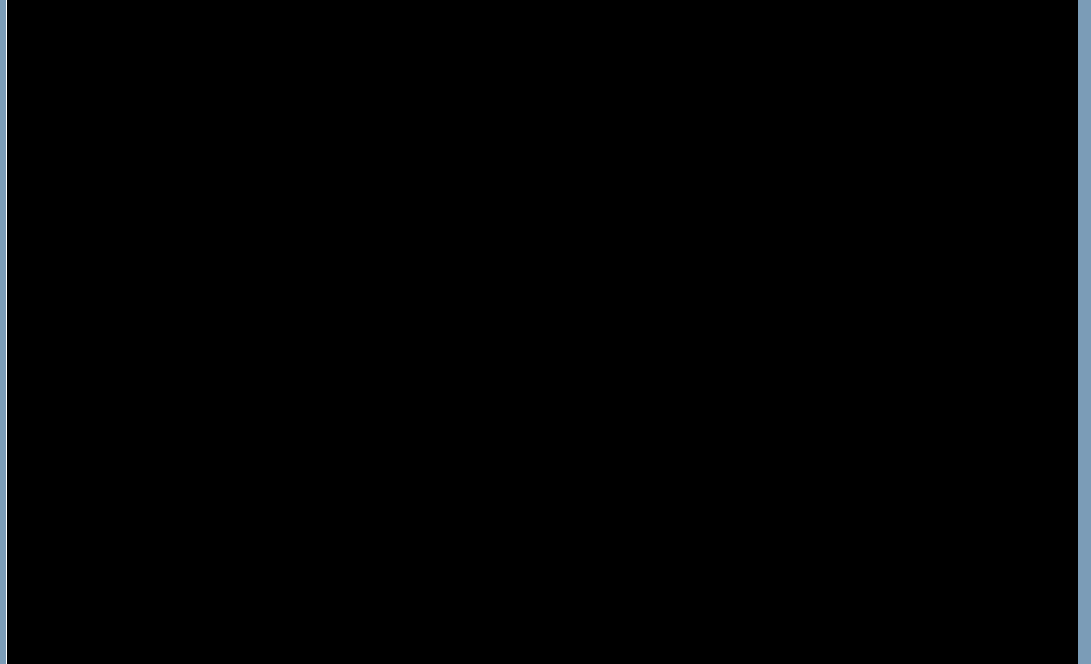
The figures have been rounded and do not sum to 100%. Therefore, the number of stick people representing slow moving pupils at L4 has been adjusted to ensure that the total sums to 100%

Chapter 3:

Identifying slow moving pupils in mathematics in KS3

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| Pupil characteristics | 14 |
| Specific issues arising | 16 |
| Other significant findings | 18 |

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3 Identifying slow moving pupils in mathematics in KS3

The main findings from the investigation are grouped into three separate sections: the pupil characteristics, a summary of the specific issues arising and other significant findings.

Pupil characteristics

“Reflecting on these pupils is making me think – does their lack of confidence with mathematics mean I make the challenge lower so they can get it right? Am I slowing down their progress?” (Year 8 teacher)

“They like lessons when they can get 20 questions right without having to think about it. I try to deploy teachers to these groups who will focus on getting them to talk, explain and think – so they understand the mathematics.” (Mathematics subject leader)

“Sometimes I guess an answer and the teacher says it shows I’m doing really well, but I’m not – I haven’t got a clue what I’m doing most of the time.” (Year 9 girl)

“When the teacher stops talking that means we can start to chat while we work.” (Year 8 boy)

“I want to be a hairdresser. What’s maths got to do with that?” (Year 9 girl)

- Most said they had never been able to do mathematics – they felt they had always struggled in primary and secondary school
- Most viewed mathematics as important to their current and future lives, although a few (mostly girls) said mathematics was irrelevant to them
- They saw their relationship with their mathematics teacher as relevant to their effort and progress
- They found working through exercises from a textbook or worksheets boring and, if they did this a lot, they usually disliked mathematics
- They were enthusiastic about ‘fun’ activities such as games and using the interactive whiteboard, but most did not do these often
- They said they liked the work to be easy so they could get it right; they judged their success in mathematics by how many questions they got right

- They felt uncomfortable answering questions orally, and would often answer quickly, not using thinking time and guessing if necessary
- They were reluctant to explain their methods – they found this hard
- They often had low level literacy skills
- Many seemed to be used to not fully understanding what they were doing – they knew they would have difficulty remembering the method
- Some wanted to be left to get on with their work quietly
- Many said they did not work hard in mathematics and often wasted time chatting to their friends
- They quickly stopped trying if the work was too hard – they would probably ask for help but this might not resolve the problem
- They said they had never understood fractions or division
- Some avoided revealing their difficulties by copying from others – they preferred to copy than ask for help from their teacher
- They were affected by poor behaviour in their class – some because they found it hard to concentrate and others because they were drawn into the poor behaviour
- They wanted to improve in mathematics and achieve their target (usually Level 5) but had little idea of the areas of mathematics they needed to focus on

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Specific issues arising

Pupils' own comments, together with evidence provided by their teachers and senior leaders, suggested the following:

"We know we have a tendency to lead these pupils too much when we are doing problem solving. We need to work on developing their problem solving skills." (Mathematics subject leader)

"They find discussion and open activity difficult. They don't like thinking processes and talking things through because they just want to get on. However, if you persevere, slowly by slowly you see a transition." (Year 8 teacher)

"Use of vocabulary is an example of the sort of thing we focus on strongly in September each year, but then it tails off quickly." (Year 8 teacher)

"The teacher tells us maths words like prime factor and sequence and we write them down, but I don't know what they mean." (Year 9 girl)

Using and applying mathematics

- Virtually all pupils struggled to talk about mathematics other than in vague terms. They used few mathematical words, and often could not identify key words for their current work in class. All teachers recognised the importance of the development and use of vocabulary, but knew they were not focusing on this systematically. Teachers said that pupils often had difficulty reading and interpreting problems expressed in words.
- Many teachers said that the pupils did not like open activities as they were unsure about what they were expected to do. Pupils were reluctant to try different approaches in problem solving and when calculating mentally.
- Most pupils had limited experiences of using calculators and had difficulty interpreting the display. When calculating they often did not have a feel for the size of an answer.
- Pupils could complete tables and draw simple charts and graphs for given information accurately, but they had difficulty deciding on scales for axes and ways of structuring data into a table. They also found it hard to draw conclusions from graphs and charts.

Number and algebra

- Mental calculation was a significant weakness for most of these pupils. Many were reluctant to try to calculate mentally and said they had difficulty keeping intermediate information in their heads. They visualised and described column methods when calculating mentally, often making mistakes, and said they felt more confident if they used written methods. Many pupils said they were put off by 'big' numbers – for some this meant numbers greater than 100.

- Most pupils understood and were more confident with addition and multiplication than subtraction and division. However, they rarely had a feel for relationships when working with number. Many pupils did not see or use the links between related calculations, for example not recognising they could use $4 \times 7 = 28$ to calculate 8×7 . Virtually all the pupils said they found division hard, including recalling simple division facts. Most pupils did not have a feel for the links between the operations of subtraction and division.
- Most pupils could order decimals in the context of money, and could position simple decimals on a number line, but their understanding of place value was often not secure and most thought that 2.52 was greater than 2.6.
- Virtually all pupils said they did not understand fractions. While they could use visual representations of fractions (for example comparing the relative size of fractions as part of a pizza), most had not progressed to being able to compare and order fractions. When placing simple fractions on a number line they often assumed that the larger the denominator, the larger the fraction.
- Most pupils had limited experience of algebra and attitudes were mixed. Some pupils enjoyed solving simple equations and were developing an understanding of unknowns, but most pupils did not have a feel for the difference between an unknown and a variable.

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Other significant findings

Teaching and learning

“When the teacher writes on the board we have to copy it very quickly to get it down so I don’t get a chance to understand it.” (Year 8 boy)

“They need lots of prompts, particularly visual ones. I like to use diagrams, grids, number lines and mind maps.” (Year 9 teacher)

“It needs to be hands on and fun for these pupils. They need to learn to enjoy maths.” (Year 8 teacher)

“Questioning these pupils can be difficult. I often find I’m giving them the answers.” (Year 8 teacher)

“I feel more confident working with a partner. It doesn’t matter if you do something wrong.” (Year 8 girl)

- Context and practical application that related to their own experience seemed particularly significant for these pupils in making sense of mathematics. Teachers talked about pupils enjoying and being more successful with practical activities, although they often knew they did not use these approaches enough in lessons.
- Most pupils found visual representations helpful in strengthening their understanding, for example many could use and explain the grid method for multiplication. However, there was very little evidence of schools using other visual images, for example number lines to help pupils see links between fractions, decimals and percentages or to position and order numbers in different forms.
- In just under half the schools, pupils described many of their mathematics lessons as boring. Some felt they listened and copied during the first part of the lesson and then usually worked on their own from worksheets or a textbook. They often repeated the given method in their books and would persevere if they found it easy, but would give up if they thought it was too hard. These pupils talked about having difficulty remembering what they had done in earlier lessons, and said they often did not understand what they were doing.
- Many pupils said they enjoyed games and puzzles, but only did this for short parts of lessons, often at the end as a reward for good behaviour. Pupils in just over a quarter of the schools visited said they usually worked in pairs and did a lot of practical work and games in their lessons. These pupils often rated mathematics as one of their favourite subjects.
- Many pupils said they would not volunteer an answer to a question in class unless they were sure they were right. Often they did not want other pupils to know they could not do the work – so they preferred to keep quiet. Some teachers recognised that they avoided asking these pupils questions and would leave them if they seemed to be doing their work. These teachers said they felt unsure of how to support pupils when they could not answer their questions, particularly during whole class teaching.

- Pupils' exercise books were often a record of the exercises they had done and were sometimes just the answers to exercises. Pupils rarely recorded notes of their own key ideas and skills for topics and said they did not view their exercise books as being useful to them.
- Pupils' weak literacy skills were often seen as a key obstacle to progress in mathematics. Many teachers said that low levels of confidence with speaking and articulating ideas often inhibited pupils in expressing and explaining their mathematical thinking. Teachers also said pupils had difficulty reading and interpreting mathematical problems and situations described in words. Some schools were increasing their focus on paired work and talk in the classroom as a strategy to address these weaknesses and build pupil confidence.

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Assessment and target setting

“I achieved my target. I got a Level 4 for mathematics. I thought I’d done really well and was sure I’d get a Level 5. I don’t know why I didn’t get a Level 5. I’m really disappointed.” (Year 9 girl)

“It’s good that teachers tell us the learning objectives in lessons. It means that you know what you are trying to achieve by the end of the lesson.” (Year 9 girl)

“As a team we need to do more work on understanding levels in terms of progression within a topic so we can set clearer targets. The progression maps will be great for this.”
(Mathematics subject leader)

- Many schools were beginning to use strategies to involve pupils in assessing their learning. Most pupils recorded learning objectives in their exercise books. However, often pupils were unclear about the purpose of strategies like ‘traffic lighting’. They saw traffic lighting as being for the teacher – not for them. They also tended to see self-assessment as an end point, mainly because they perceived that nothing happened if they indicated they had difficulties with the work.
- Most pupils were unable to talk about their strengths and weaknesses in mathematics. Although most pupils had a Level 5 target, very few had curricular targets for mathematics so did not know what they needed to do to achieve their target.
- Very few pupils found the written comments from their teacher in their exercise books helpful for improving their mathematics.

Intervention

“We need to involve the parents of these pupils more. They could help to improve their child’s progress in mathematics – they would want to help. We need to provide more information so they know how they can help.” (Headteacher)

“My dad says maths is the most important thing for getting a job.” (Year 8 boy)

“We think very carefully about the pupils who will benefit most from one-to-one support in Year 7. We have the most success with pupils who lack confidence in mathematics. It’s great when you see them taking an active part in their lessons.” (Teaching assistant)

- Most of the pupils who started Key Stage 3 at Level 3 were taught in classes with others of similar ability. Many schools prioritised these groups for teaching assistant support for some of their lessons. Some pupils felt they gained a great deal from working regularly with a teaching assistant they knew. A few schools were beginning to explore how teaching assistants might support pupils in working collaboratively and talking about their ideas and methods when doing mathematics.

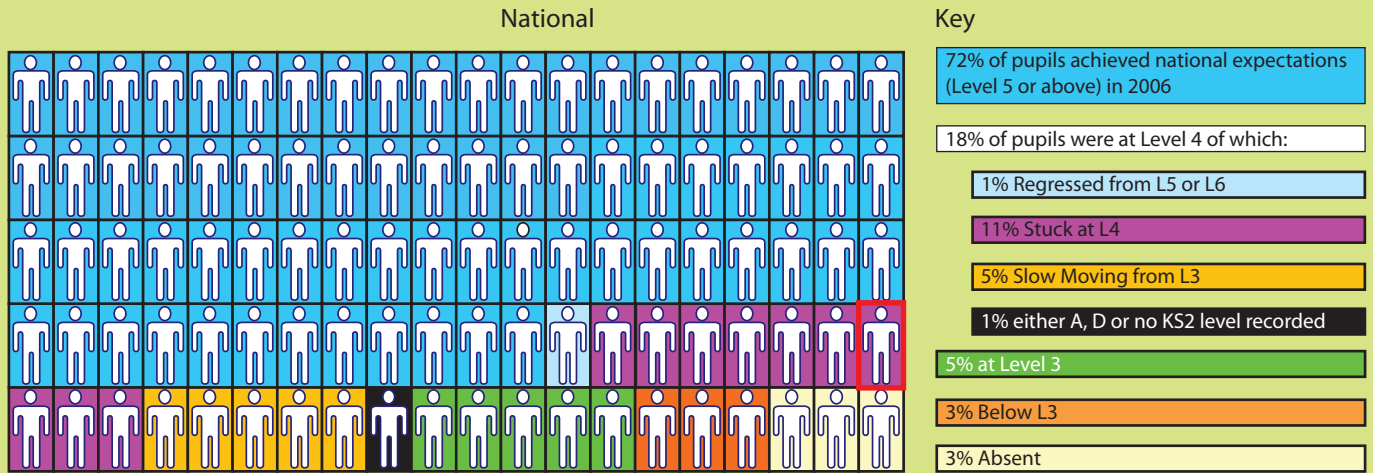
- Most intervention support was targeted at the Year 9 pupils. Many pupils were not aware of specific intervention strategies, for example the use of Booster lessons, as these were incorporated into Year 9 teaching time. In some schools intervention activities were planned to be very close to the tests, for example collapsing the timetable to give a whole day to mathematics.
- Several schools were beginning to use strategies to get a picture of pupils' specific strengths and weaknesses in mathematics. These subject leaders felt their findings would help them to focus intervention work more on pupil need in the future.
- Most pupils said that their parents wanted them to do well in mathematics as they saw it as important for their futures, but many schools had difficulty engaging these parents in academic events like academic review days. A few schools were beginning to communicate more regularly with the parents of pupils who progress was causing concern to share information on how they were being supported in school.

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Pupil Progression Chart – KS3 Science (2006)

Yellow represents those pupils who entered the key stage at Level 3 and have made progress to Level 4 by the end of the key stage. Within the green category will be some pupils who entered the key stage at Level 3 and remained at that level throughout the key stage.



The figures have been rounded and do not sum to 100%. Therefore, the number of stick people representing 'stuck' pupils at L4 has been adjusted to ensure that the total sums to 100%

Chapter 4:

Identifying slow moving pupils in science in KS3

| | |
|----------------------------|----|
| Pupil characteristics | 24 |
| Specific issues arising | 25 |
| Other significant findings | 27 |

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4 Identifying slow moving pupils in science in KS3

The main findings from the investigation are grouped into three separate sections: the pupil characteristics, a summary of the specific issues arising and other significant findings.

Pupil characteristics

“The contextual value-added system we use in the school to predict end of key stage levels doesn’t predict a Level 5 for any of those who started with a Level 3.” (Science subject leader)

“I expect to get a Level 6 in science.” (Year 9 pupil)

- The majority were keen to talk about their work, although a small minority were very reserved and quiet
- A small proportion lacked self-esteem and self-confidence
- A significant proportion were very disorganised and this was reflected in their exercise books and how their teachers talked about their work in class (typically they did not take books or writing equipment to their lessons, they didn’t organise their homework, etc.)
- Many had very little memory of the work they had been doing in science apart from that in the last lesson and then referred to ‘practical work’ – they were often much less clear about the scientific content of the science lessons
- In many ways they were not aware of their difficulties so, for example, they didn’t acknowledge any specific difficulties with science or with literacy and numeracy and had very optimistic expectations of the levels they might achieve in the national tests
- They displayed short concentration spans in lessons and quickly lost the thread of what they were doing
- Nearly half of them admitted that they were often associated with low-level disruption in lessons (talking, walking about, etc.)
- Many had no self-help strategies other than asking the teacher
- Some were unwilling to volunteer answers to questions in class
- A minority of the pupils had relatively low attendance (at or below 80%)
- They liked practical work or activities such as quizzes
- A few cited science as their favourite subject and for many it was seen as above the middle in their subject rank order of interest – there was, however, a strong impression that the popularity of the subject was waning towards the end of Year 9

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Specific issues arising

Pupils' own comments, together with evidence provided by their teachers and senior leaders, suggested the following:

In scientific enquiry (Sc1)

"Science is exciting. The experiments are great – there are so many different things you can do."
(Year 8 pupil)

"I just don't know what a variable is!" (Year 8 pupil)

"I don't get graphs!" (Year 9 pupil)

- They enjoyed the practical work and were engaged in practical activities in about half of their lessons. In most cases this involved following instructions, taking observations or measurements and then presenting their results. Although some pupils talked about using more investigative approaches, and in some of the schools these were well integrated into the scheme of work, overall the pupils had relatively few opportunities to choose their own approaches or methods.
- The majority of the pupils were able to explain a fair test but were much less likely to be able to draw simple conclusions from their practical work or to make straight forward evaluations of strengths and weaknesses of their approach.

- According to their teachers these pupils were often put off by test questions which presented experimental methods and results, particularly when the contexts were unfamiliar.
- Pupils said that the use of terms such as 'dependent', 'independent' and 'control', used in the context of a discussion of variables, was very confusing and acted as an obstacle to their learning.
- The opportunities to use graphs to present experimental evidence were relatively infrequent and, when bar charts were used, they were often drawn poorly without due attention to accuracy and presentation.

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Subject content (Sc2, 3 and 4)

“The particles will heat up and absorb all the cold out of the solid.” (Year 8 pupil)

“I think I did a practical but I can’t remember what it was about.” (Year 9 pupil)

“Photosynthesis – I think that is something to do with animals.” (Year 9 pupil)

- The pupils identified a range of topics they found difficult but examples tended to be from the topics they were currently studying. The pupils’ limited longer term recall of previous work prevented a more detailed exploration of common areas of difficulty, although it was clear that these pupils found particular aspects of all topics challenging.
- In discussion the pupils were able to talk about their recent science lessons, sometimes recalling technical terms such as ‘conductor’ and ‘respiration’. However, they struggled when dealing with abstract rather than concrete ideas, for example few pupils were able to demonstrate even a basic grasp of concepts such as the particulate nature of matter or how sound travels.
- A significant number of the pupils didn’t view their experiences in their science lessons in a broader context. For example, they didn’t seem to have any desire to engage in talking about topical issues, such as global warming.

Other significant findings

Literacy and numeracy

“I am really disappointed when I get my marks – I never do as well in tests as I thought I had.” (Year 9 pupil)

- For many of the pupils improving their attainment in science was dependent on them developing their literacy skills. However, this was not the case for all the pupils and, in some cases, limitations in writing, for example, were clearly not an obstacle to progress in science.
- Typically the pupils were able to demonstrate a greater level of understanding orally than in writing. A few pupils said they were always disappointed when they got their test results back because they thought that they had a better understanding than their mark indicated.
- Evidence from the pupils’ books indicated that the pupils were given relatively few opportunities to explain ideas and results and when they were they had difficulty in making the transition from writing descriptions to writing explanations.
- When answering test questions the pupils often didn’t understand exactly what was required by command words such as ‘explain’, ‘analyse’ and ‘evaluate’. Consequently, they often misinterpreted the requirements of the question.
- In the pupils’ books there were examples of effective use of bar charts but very few examples of line graphs. As mentioned previously, graphs were often poorly presented.

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Lesson structure

“The teacher talks and we listen and then we do some writing.” (Year 8 pupil)

“We do group work in geography – we have to work as a team on a project – we don’t do this in science.” (Year 9 pupil)

“I suppose some of the most demanding writing tasks, such as writing conclusions and evaluations, are done at the end of the lessons or for homework.” (Science teacher)

- The pupils reported that writing was a central feature of many of their science lessons, typically involving copying from the board or from a text book. A number of pupils complained that because they took a long time to write down information they never finished the work before the teacher moved on to other activities. Unsurprisingly, these pupils’ books frequently contained incomplete work.
- The target group of pupils often received support in their English and mathematics lessons, either from a teaching assistant in the lesson or through withdrawal for individual or small group work. Such support was frequently not available in science. Perversely, a possible impact of the support in English and mathematics was that the pupils were less prepared to work independently in science.

- The pupils experienced a variety of activities in their science lessons, ranging from quizzes to the use of simulations and interactive whiteboards. From the pupils' perspectives their teachers often talked for a large proportion of their lessons with the exception of when they were engaged in practical activity. It appeared that group work was rarely used.
- There was some evidence to suggest that whilst striving to teach lessons with pace, teachers sometimes limited time for discussion and reflection. As a consequence, some of the pupils struggled to assimilate and consolidate their learning.

Assessment, target setting and tracking

"Last year 42 pupils achieved their 'golden' target' (the golden target is the best improvement any pupil in the school has ever achieved from that Key Stage 2 starting point." (Senior leader)

"I don't know what this means." (Year 8 pupil looking at a teacher's comment in the exercise book – 'include the question in your answer')

- Most pupils were aware of their science target for the end of the key stage. In some schools, however, targets were set in line with the statutory requirements (i.e. for Year 8 pupils) and so pupils in Year 7 were not given targets.
- Schools used a variety of predictive methods to inform their target setting. In some cases this created low expectations for those pupils starting the key stage with a Level 3 in science with the consequence that few, if any, were expected to achieve a Level 5 by the end of Key Stage 3. In contrast, other schools set an additional aspirational target which when presented as part of a 'can do' culture resulted in a significant proportions of the target group making two levels of progress during the key stage.
- The majority of the schools visited used summary sheets which listed expected learning outcomes against national curriculum levels. Whilst an effective approach for many pupils, evidence from the pupils suggested that they didn't always understand what the written outcomes actually meant and this limited the impact of the approach.
- Typically the schools monitored pupil progress as a result of their scores on end of unit tests. Increasingly schools were combining tests to encompass several months or half a year's work to limit fragmentation of the curriculum and encourage the pupils to appreciate the links between topics. Schools reported as an additional benefit that pupils' progress was 'smoothed out' and didn't fluctuate to the extent it can do between individual topic tests and so gave a better measure of progress.
- Pupils in a number of schools said that teachers spent a long time going over topic tests. For the group of pupils interviewed this practice appeared to have limited value. From the pupils' perspectives they were moving on to a new topic which didn't relate to the one just tested. Some of the pupils clearly saw the process as 'putting failure back in front of you' and didn't see it as helping their learning.
- The pupils' books were regularly marked but the pupils found some of the comments difficult to respond to. For example, comments such as 'include the question in your answer' and 'give a reason for this' didn't really elicit the desired response from the pupils.

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Intervention and progression

“We tend to focus more on Key Stage 4, apart from the work we do in preparing for the tests in Year 9.” (Science subject leader)

- For many schools their intervention strategy in science was focused on the Level 4/5 borderline pupils and commenced mid-way through Year 9. Few of the schools visited had specifically targeted the Level 3 science pupils in Years 7 and 8, although such targeting in English and mathematics was much more common.
- The links between progress in science and literacy development, whilst acknowledged as a key factor in the schools visited, had resulted in limited co-ordination between English or Special Educational Needs (SEN) departments and science departments.
- In some of the schools visited, resources were differentiated so that, for example, the target group of pupils were given worksheets with reduced reading or comprehension demands. Other forms of in-class intervention depended on the teacher tailoring his/ her approach to the specific needs of the pupils. Support from teaching assistants for the pupils in science lessons was relatively uncommon.
- All the schools provided additional lessons in the run up to the Year 9 tests. In some cases these were during the school day, as a result of modifications to the school timetable, but more frequently these were lunchtime or after-school sessions. Evidence from a number of the schools suggested that such out of lesson opportunities were often not utilised by the target group of pupils.

Chapter 5:

Taking action across the whole school

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5 Taking action across the whole school

This chapter highlights possible action that can be taken to address some of the key issues that cut across all three subject areas

Issue 1:

Engaging with teacher feedback to secure the target-getting process

Key concerns

English

- Senior leaders tended to have higher expectations for progression than subject teachers although, on the whole, there seemed to be an acceptance that a good proportion of pupils entering Key Stage 3 at Level 3 in English would not progress by two levels over the key stage. Many teachers felt that these pupils had been struggling to catch up ever since primary school.
- Most pupils knew their numerical target and they understood the importance of Level 5. However, no pupil knew how to attain Level 5 and offered suggestions such as “Try your hardest,” or “Study and do your homework.” Some pupils were expected to select their own targets from a statement bank. Many targets were vague, such as, “Paragraphs,” or low level, such as, “Get my spelling better,” or “Improve presentation.”
- Teachers generally provided written feedback on pupils’ work but this was usually task specific and therefore it was often difficult to relate it to future work. The target-getting process was considered unmanageable by many teachers as they would often set a different target each time a piece of work was marked.
- Pupils showed little engagement with written teacher feedback. Some said that they looked at the level but didn’t read the comment if the level was disappointing. Pupils were given little time to reflect and act on their teachers’ comments although several said that they liked written feedback as they could return to it later.

Mathematics

- Many schools were beginning to use strategies to involve pupils in assessing their learning. Most pupils recorded learning objectives in their exercise books. However, often pupils were unclear about the purpose of strategies like ‘traffic lighting’. They saw traffic lighting as being for the teacher – not for them. They also tended to see self-assessment as an end point, mainly because they perceived that nothing happened if they indicated they had difficulties with the work.

- Most pupils were unable to talk about their strengths and weaknesses in mathematics. Although most pupils had a Level 5 target, very few had curricular targets for mathematics so did not know what they needed to do to achieve their target.
- Very few pupils found the written comments from their teacher in their exercise books helpful for improving their mathematics.

Science

- Most pupils were aware of their science target for the end of the key stage. In some schools, however, targets were set in line with the statutory requirements (i.e. for Year 8 pupils) and so pupils in Year 7 were not given targets.
- Schools used a variety of predictive methods to inform their target setting. In some cases this created low expectations for those pupils starting the key stage with a Level 3 in science with the consequence that few, if any, were expected to achieve a Level 5 by the end of Key Stage 3. In contrast, other schools set an additional aspirational target which when presented as part of a 'can do' culture resulted in a significant proportions of the target group making two levels of progress during the key stage.
- In many ways the pupils were not aware of their difficulties so, for example, they didn't acknowledge any specific difficulties with science or with literacy and numeracy and had very optimistic expectations of the levels they might achieve in the national tests.
- The majority of the schools visited used summary sheets which listed expected learning outcomes against national curriculum levels. Whilst an effective approach for many pupils, evidence from the target group of pupils suggested that they didn't always understand what the written outcomes actually meant and this limited the impact of the approach.
- The pupils' books were regularly marked but the pupils found some of the comments difficult to respond to. For example, comments such as 'include the question in your answer' and 'give a reason for this' didn't really elicit the desired response from the pupils.
- Pupils in a number of schools said that teachers spent a long time going over topic tests. For the group of pupils interviewed this practice appeared to have limited value. From the pupils' perspectives they were moving on to a new topic which didn't relate to the one just tested. Some of the pupils clearly saw the process as 'putting failure back in front of you' and didn't see it as helping their learning.

What might subject leaders do to address this issue?

- Plan and agree opportunities to set and review targets during a unit of work rather than retrospectively so that pupils have time to work on their targets prior to completion of the unit
- Use a system of rewards to encourage pupils to provide explicit evidence of progress towards their targets, perhaps by annotating or highlighting a piece of classwork or homework
- Plan peer assessment activities such as using pupil-friendly mark schemes to assess answers to Key Stage 3 test questions. Encourage pupils to justify why marks should be given and to give appropriate feedback and targets
- Work with colleagues to develop skills in writing crisp, clear subject-specific targets in language that pupils can understand – avoid targets which are vague or unclear
- Encourage teachers to involve pupils in the setting of their targets
- Involve teaching assistants in the discussion and understanding of targets for this group of pupils
- Where appropriate, plan and model activities that address group targets that teachers have identified, e.g. during lesson starter activities
- Consider phrasing targets as questions which require a response from the pupil
- Promote the discussion of success criteria with pupils in advance of a piece of work which they can then use to peer assess or traffic light/RAG rate their own work
- Encourage teachers to provide sufficient time for pupils to respond to feedback, perhaps by using a response partner
- Encourage teachers to engage in a dialogue with pupils about their work – this could take the form of a note from the pupil about aspects of the work they found difficult
- Explore with teachers the use of guided work to provide immediate feedback during a lesson
- Promote the notion that feedback should relate specifically to the learning objective and the shared success criteria
- Build some flexibility into the scheme of work so that three or four times a year the scheme of work can be suspended for a week to allow teachers to target specific needs with individual pupils or with whole classes

Issue 2: Securing transferable literacy skills across subjects

Key concerns

English

- Pupils didn't readily transfer their learning in English to other subjects. It was widely felt that literacy across the curriculum had not maintained its momentum and a number of schools had decided to renew their focus on this in order to embed and apply pupils' literacy skills across the curriculum. In one school, extra non-contact time for English teachers was being used to provide in-class support for the transfer of pupils' literacy skills in other subjects.

Mathematics

- Virtually all pupils struggled to talk about mathematics other than in vague terms. They used few mathematical words, and often could not identify key words for their current work in class. All teachers recognised the importance of the development and use of vocabulary, but knew they were not focusing on this systematically. Teachers said that pupils often had difficulty reading and interpreting problems expressed in words.
- Pupils' weak literacy skills were often seen as a key obstacle to progress in mathematics. Many teachers said that low levels of confidence with speaking and articulating ideas often inhibited pupils in expressing and explaining their mathematical thinking. Teachers also said pupils had difficulty reading and interpreting mathematical problems and situations described in words. Some schools were increasing their focus on paired work and talk in the classroom as a strategy to address these weaknesses and build pupil confidence.

Science

- Pupils said that the use of terms such as 'dependent', 'independent' and 'control', used in the context of a discussion of variables, was very confusing and acted as an obstacle to their learning.
- Typically the pupils were able to demonstrate a greater level of understanding orally than in writing. A few pupils said they were always disappointed when they got their test results back because they thought that they had a better understanding than their mark indicated.
- When answering test questions the pupils often didn't understand exactly what was required by command words such as 'explain', 'analyse' and 'evaluate'. Consequently, they often misinterpreted the requirements of the question.

What might subject leaders do to address this issue?

- Facilitate cross departmental lesson observation and working alongside colleagues using, for example, work scrutiny as a means of identifying specific obstacles to progress
- Explore the timetabling/resource implications of an English teacher providing on-going support in selected science/mathematics lessons
- Encourage the use of specific literacy targets across the core subjects to encompass key vocabulary, the use of 'command words' and the instructional language used in national tests
- Ensure that word walls are refreshed so that they are in harmony with current work and that they are used actively in the lessons
- Emphasise the importance of extracting key information from extracts of writing and use approaches such as Point Evidence Explanation (PEE) as a means of tightly focusing speaking and listening, reading and writing
- Encourage teachers to model approaches such as PEE so that pupils begin to use the technique outside English lessons (don't assume that the pupils will automatically transfer techniques they use in English to other lessons)
- Use writing frames to structure the writing task, discourage a 'rush to writing' where the writing task is set without sufficient discussion or explanation
- Use older students as mentors, working with the pupils in lessons or in tutor periods and focusing on current work

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Chapter 6:

Taking action in English

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6 Taking action in English

This chapter highlights possible action that can be taken to address some of the key issues in English.

Issue 3: Securing the building blocks of writing

Key concerns

- Pupils lacked a feel for the overall shape of a sentence, often losing track of the ending part way through. Some felt that they repeated themselves unnecessarily as a result. This was often a result of not reading back their writing to themselves during the composition process.
- Many pupils said that they were often too busy writing to remember about punctuation and tended to rely on their limited editing and proofreading skills to scan for errors retrospectively.
- Paragraph structure was insecure and pupils had difficulty clustering and developing their ideas within a paragraph, often resulting in short, one sentence paragraphs in their writing.

What do pupils need if they are to address this issue?

- An understanding of sentence types: simple, compound and complex
- An understanding of the purpose and effect of different sentence types so that they know when to use them for best effect
- Opportunities to rehearse sentences orally as well as on paper, especially through shared and guided writing
- Frequent reinforcement of sentence level work across all year groups and subjects
- Teacher demonstration of the way punctuation is used to shape meaning during the writing process
- Opportunities for peer assessment with a sentence level or punctuation focus
- An understanding that paragraphs have to be constructed and cannot simply be identified retrospectively in an unstructured piece of work
- A range of planning strategies

What do teachers need if they are to address this issue?

- Confidence to model writing, including “thinking aloud” to verbalise the choices a writer makes during the writing process
- Secure subject knowledge and access to high quality support materials
- A shared understanding of how to teach pupils with insecure literacy skills
- A consistent approach to literacy skills (and literacy targets) across the curriculum
- A shared marking policy for literacy across subjects

What support can English subject leaders provide?

- Support for new staff and non-specialist English teachers regarding subject and pedagogical knowledge and understanding
- Close liaison with the whole school literacy coordinator
- The provision of specific literacy guidance built into schemes of work
- Close liaison with SEN colleagues, especially if they deliver the Literacy Progress Units

Issue 4:

Developing a range of more formal repertoires

Key concerns

- Pupils often displayed good oral skills and could articulate and share well developed ideas. However, their talk often lacked formality and a wider awareness of audience and did not always transfer to improved outcomes in their writing.
- Teachers said that whereas they planned speaking and listening activities into their lessons, they rarely modelled speaking and listening explicitly. Even though they considered speaking and listening to be key for these pupils, they felt that they did not teach these skills in the same way as reading or writing.
- Some teachers believed that the informal style of pupils’ personal reading diets pervaded their writing in school, making it inappropriately colloquial when the task required a more formal style. Both pupils and teachers were concerned that the language of texting and e-mail sometimes crept inappropriately into their writing when a more formal genre was required.

What do pupils need if they are to address this issue?

- Access to modelled examples of a range of more formal talk repertoires and genuine opportunities to use them
- Speaking and listening frames, such as sentence starters for asking and answering questions in more formal situations
- An understanding that writing is not simply 'talk written down'
- Clear, agreed success criteria, prior to a spoken or written task, grounded in purpose, audience and form
- Opportunities for peer-editing with a clear focus on appropriateness for audience and purpose
- Real opportunities to use spoken and written language in formal as well as informal situations

What do teachers need if they are to address this issue?

- Confidence to model a range of more formal talk repertoires
- Confidence to support pupil talk rather than simply to initiate it
- Flexibility to give more time and a higher profile to speaking and listening in lessons
- Provision of planned and appropriate opportunities for talk prior to writing, e.g. holding a debate prior to writing a piece of formal argument in order to allow pupils to rehearse and articulate their ideas
- Skills to use shared writing to support pupils in adapting their talk for writing, e.g. invite pupils to say what they want to say, then say what they will write down
- Opportunities in the scheme of work to explore a range of formal and informal language, with a focus on appropriateness for purpose and audience

What support can English subject leaders provide?

- Secure progression in speaking and listening throughout the years and key stages so that pupils gradually acquire the higher order speaking and listening skills they need at Key Stage 4 and beyond
- Support for curriculum enrichment activities, such as public speaking competitions, to encourage formal talk
- Liaison with other subject areas to support speaking and listening across the curriculum
- Lesson observations which focus on the balance of teacher talk, paired/group talk and individual work
- Displays which focus on formal and informal language

Issue 5: Sustaining gains made through intervention support

Key concerns

- Many pupils had received intervention support in the form of Literacy Progress Units and many had made good progress during the units. However, there was little evidence that their gains were maintained over time and their progress was rarely monitored or tracked once the programme had finished.
- Pupils didn't readily transfer their learning from intervention sessions to English lessons or to other lessons across the curriculum. This seemed to be largely a result of the fact that this additional support was rarely integrated into the English curriculum and English teachers were often unaware of the actual support pupils had received. Support was sometimes delivered by LSAs within the SEN team.
- There was very little awareness of the primary intervention programmes which these pupils had received earlier in their school careers.

What do pupils need if they are to address this issue?

- Continuity across the curriculum and phases so that they and their teachers have a shared understanding of different aspects of writing and their application, e.g. connectives in a range of text types
- A small number of literacy targets which are shared and reinforced across the curriculum and with parents/carers
- Explicit opportunities to apply their learning from intervention programmes, such as the Literacy Progress Units, to mainstream English lessons as well as other subjects

What do teachers need if they are to address this issue?

- Close liaison with colleagues responsible for delivering additional literacy programmes, such as the Literacy Progress Units, so that they know exactly what pupils have covered and the progress they have made
- An expectation that they will support pupils in applying and transferring their new learning in their lessons
- A stake in the identification of their pupils who are allocated additional support and discussion of their specific needs
- Information about Key Stage 2 intervention programmes and the pupils who have received them

What support can English subject leaders provide?

- Close links with partner primary schools so that pupils who are likely to struggle in Year 7 are identified early
- Transfer of information from partner primary schools regarding the additional intervention support received by incoming pupils
- Regular liaison with the SEN co-ordinator
- Support and training for teachers who are insecure with the teaching of basic literacy skills
- Systems to track pupil progress which contribute to an evaluation of the sustained impact of intervention support

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Chapter 7:

Taking action in mathematics

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7 Taking action in mathematics

This chapter highlights possible action that can be taken to address some of the key issues in mathematics.

Issue 6:

Supporting progression from real to abstract contexts

Key concerns

- Context and practical application that related to their own experience seemed particularly significant for these pupils in making sense of mathematics. Teachers talked about pupils enjoying and being more successful with practical activities, although they often knew they did not use these approaches enough in lessons.
- Most pupils could order decimals in the context of money, and could position simple decimals on a number line, but their understanding of place value was often not secure and most thought that 2.52 was greater than 2.6.
- Virtually all pupils said they did not understand fractions. While they could use visual representations of fractions (for example comparing the relative size of fractions as part of a pizza), most had not progressed to being able to compare and order fractions. When placing simple fractions on a number line they often assumed the larger the denominator, the larger the fraction.
- Most pupils found visual representations helpful in strengthening their understanding, for example many could use and explain the grid method for multiplication. However, there was very little evidence of schools using other visual images, for example number lines to help pupils see links between fractions, decimals and percentages or to position and order numbers in different forms.

What do pupils need if they are to address this issue?

- A range of opportunities in lessons to work on practical activities and to relate the mathematics to a relevant context
- A stronger focus on the use of images and models to help pupils visualise links and relationships in mathematics, for example using fraction walls to compare and order fractions as a precursor to positioning fractions on a number line
- Explicit teaching, sometimes in small groups, to help pupils move from using a model as a learning resource to imagining and describing the model when working on problems
- Encouragement to use visual images flexibly to help pupils see links, for example, between fractions, decimals and percentages using 'spider diagrams' and number lines
- Encouragement and support to revert to relevant visual images, models and practical contexts when they are unsure
- Support in making their own notes in their work that link the 'real' to the abstract, for example showing the links between the grid method to multiply and the formal written method

What do teachers need if they are to address this issue?

- Collaborative work to explore the potential for using key visual images, for example number lines and fraction walls, to help pupils make sense of mathematics
- References in schemes of work to links and progression in the use of images and models, including ideas for developing pupils' visualisation skills
- Ideas and strategies for using more practical activities in their lessons
- Support from colleagues, perhaps through paired planning and teaching, to try more practical and visual approaches in the classroom
- Opportunities to discuss with colleagues ways to help pupils to record their work in ways that strengthen their learning

What support can mathematics subject leaders provide?

- Opportunities and encouragement for teachers to work together in the classroom so they can experiment with practical and visual approaches to mathematics
- Time in departmental meetings to discuss practical applications and explore strategies to help pupils progress from the 'real' to the abstract in mathematics
- Focused work on key topics, for example fractions, decimals and percentages, to explore and evaluate the effectiveness of the use of images, models and contexts

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Issue 7: Improving pupils' confidence in talking about mathematics

Key concerns

- Many pupils said they would not volunteer an answer to a question in class unless they were sure they were right. Often they did not want other pupils to know they could not do the work – so they preferred to keep quiet. Some teachers recognised that they avoided asking these pupils questions and would leave them if they seemed to be doing their work. These teachers said they felt unsure of how to support pupils when they could not answer their questions, particularly during whole class teaching.
- Pupils' weak literacy skills were often seen as a key obstacle to progress in mathematics. Many teachers said that low levels of confidence with speaking and articulating ideas often inhibited pupils in expressing and explaining their mathematical thinking. Teachers also said pupils had difficulty reading and interpreting mathematical problems and situations described in words. Some schools were increasing their focus on paired work and talk in the classroom as a strategy to address these weaknesses and build pupil confidence.
- Virtually all pupils struggled to talk about mathematics other than in vague terms. They used few mathematical words and often could not identify key words for their current work in class. All teachers recognised the importance of the development and use of vocabulary but knew they were not focusing on this systematically. Teachers said that pupils often had difficulty reading and interpreting problems expressed in words.

What do pupils need if they are to address this issue?

- Opportunities to explain their methods and thinking in pairs and small groups before sharing with the whole class
- Modelling by the teacher, teaching assistant or other pupils of explanations and methods using accurate mathematical vocabulary and notation
- Opportunities to express their answers and methods in different ways, such as using mini whiteboards, to help build their confidence
- Encouragement to record their methods and thinking in their own way in their books

What do teachers need if they are to address this issue?

- Support for using paired or group work to develop mathematical talk in lessons, including ways to help pupils use mathematical vocabulary
- Opportunities to work with colleagues, including those from other subject areas, to share ideas and plan active group work where, for example, pupils present to each other
- Support for planning guided learning sessions for small groups of pupils in which they can model explanations and mathematical thinking

What support can mathematics subject leaders provide?

- Encouragement and support for teachers to try more paired and group work
- Time to work with colleagues to identify opportunities for more paired and group work in the scheme of work for mathematics
- A departmental focus on the development and use of mathematical vocabulary

Issue 8: Strengthening the use and understanding of number, including with mental calculation

Key concerns

- Mental calculation was a significant weakness for most of these pupils. Many were reluctant to try to calculate mentally and said they had difficulty keeping intermediate information in their heads. They visualised and described column methods when calculating mentally, often making mistakes, and said they felt more confident if they used written methods. Many pupils said they were put off by 'big' numbers – for some this meant numbers greater than 100.
- Most pupils understood and were more confident with addition and multiplication than subtraction and division. However, they rarely had a feel for relationships when working with number. Many pupils did not see or use the links between related calculations, for example not recognising they could use $4 \times 7 = 28$ to calculate 8×7 . Virtually all the pupils said they found division hard, including recalling simple division facts. Most pupils did not have a feel for the links between the operations of subtraction and division.
- Most pupils had limited experiences of using calculators and had difficulty interpreting the display. When calculating they often did not have a feel for the size of an answer.

What do pupils need if they are to address this issue?

- Support in seeing the calculation method as equally important as getting the correct answer
- More explicit teaching on mental calculation, including choosing more efficient methods
- Encouragement to use jottings when they feel they need to
- More experience of 'reading' a calculation and deciding whether to work it out mentally, use a written method or use a calculator; more experience of judging whether answers are sensible
- More opportunities to explore relationships and connections, for example finding and explaining answers to related calculations
- Support and guidance in using visual images such as number lines, to develop an understanding of number and relationships between numbers
- Time to work in pairs to share and evaluate different strategies for mental calculation

What do teachers need if they are to address this issue?

- Support in planning regular, explicit teaching of mental calculation strategies in their lessons
- Time to plan activities that use visual images to help pupils see relationships when working with number
- A focus on developing pupils' skills at estimating and evaluating answers whatever the topic they are studying

What support can mathematics subject leaders provide?

- Time to work with colleagues to identify opportunities in the scheme of work where pupils can apply mental calculation and estimating skills across all the strands
- Support for teachers in exploring ideas for focused work on mental calculation in most lessons
- Clear guidance on the use of calculators and the explicit teaching of calculator skills

Chapter 8:

Taking action in science

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8 Taking action in science

This chapter highlights possible action that can be taken to address some of the key issues in science.

Issue 9:

Reviewing the lesson structure with the target group of pupils in mind

Key concerns

- Many had very little memory of the work they had been doing in science apart from that in the last lesson and then referred to 'practical work' – they were often much less clear about the scientific content of the science lessons.
- They displayed short concentration spans in lessons and quickly lost the thread of what they were doing.
- The pupils identified a range of topics they found difficult but examples tended to be from the topics they were currently studying. The pupils' limited longer term recall of previous work prevented a more detailed exploration of common areas of difficulty, although it was clear that these pupils found particular aspects of all topics challenging.
- The target group of pupils often received support in their English and mathematics, either from a teaching assistant in the lesson or through withdrawal for individual or small group work. Such support was frequently not available in science. Perversely, a possible impact of the support in English and mathematics was that the pupils were less prepared to work independently in science.
- The pupils experienced a variety of activities in their science lessons, ranging from quizzes to the use of simulations and interactive whiteboards. From the pupils' perspectives their teachers often talked for a large proportion of their lessons with the exception of when they were engaged in practical activity. It appeared that group work was rarely used.

What do pupils need if they are to address this issue?

- Awareness of the 'big picture' and how units relate to one another
- Appreciation that they will need to use information acquired at a later stage
- Knowledge of what they are expected to achieve at the end of a lesson/unit
- Application of the skills acquired in literacy and numeracy effectively
- Highly structured lessons with a variety of activities (some choice) that are clearly explained, timed and actively involve them in their learning
- Opportunities to talk through, discuss, reflect on and reinforce their ideas before writing them down
- Opportunities to appreciate their scientific misconceptions
- Access to an appropriate rewards system

What do teachers need if they are to address this issue?

- Make the "big picture" clear to pupils and show how current work links to past and future work
- Build on lessons and activities to help support long term retention of key information, for example through concept mapping
- Ensure that key lesson outcomes are appropriate and attainable
- Ensure that literacy and numeracy skills learnt elsewhere are used and built on effectively
- Develop a tight lesson structure with clear timed tasks, including pupil discussion time
- Ensure that key points for learning are reinforced throughout the lesson
- Provide clear oral and written feedback to pupils about their progress and misconceptions and identify the specific next steps they need to take

What support can science subject leaders provide?

- Ensure schemes of work are appropriately detailed and show links between units in the "big picture"
- Ensure that key vocabulary and accurate terminology are insisted on by all staff
- Ensure that literacy and numeracy issues are built into the schemes of work
- Ensure lesson plans contain key points of learning, for example "aim for five" and include time for pupil discussion, reflection and reinforcement
- Monitor lessons and check the pupils' perception of lessons through questionnaires and interviews
- Consider alternative pupil groupings, staff deployment, structures for learning and the use of support staff, including teaching assistants and SEN support staff

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Issue 10: Developing higher level skills

Key concerns

- Evidence from the pupils' books indicated that the pupils were given relatively few opportunities to explain ideas and results and when they were they had difficulty in making the transition from writing descriptions to writing explanations.
- According to their teachers these pupils were often put off by test questions which presented experimental methods and results, particularly when the contexts were unfamiliar.

What do pupils need if they are to address this issue?

Opportunities to:

- discuss ideas in small groups
- present their ideas to the class
- present ideas in written form, using scaffolding as necessary
- extend their experiences to unfamiliar situations
- practise answering end of Key Stage 3 test questions
- explore their misconceptions
- explore difficult concepts through analogy, role play, etc.

What do teachers need if they are to address this issue?

- Provide opportunities for the discussion and presentation of ideas
- Provide careful scaffolding to enable pupils to succeed
- Provide opportunities for pupils to use familiar knowledge and skills in unfamiliar situations
- Ensure pupils are familiar with the 'command' words used in Key Stage 3 tests
- Provide opportunities for pupils to explore and discuss their misconceptions
- Make clear to pupils what they need to do to get to the next level

What support can science subject leaders provide?

- Ensure that appropriate opportunities for discussion and writing are built into the schemes of work
- Monitor lessons by observation and through work scrutiny
- Obtain information from pupils through questionnaires and interviews
- Ensure that staff are aware of common misconceptions – include these in the schemes of work
- Ensure that staff are using appropriate 'high value' curriculum targets to help pupils make progress
- Analyse Key Stage 2 tests to identify individual pupil and group strengths and weaknesses
- Consider short-term provision to enhance levels of support, for example the use of Initial Teacher Trainee English students to act as pupil mentors and to support small groups of pupils, both inside and outside the lesson

Issue 11:

Building a coherent approach to intervention throughout the key stage

Key concerns

- For many schools their intervention strategy in science was focused on the Level 4/5 borderline pupils and commenced mid-way through Year 9. Few of the schools visited had specifically targeted the Level 3 science pupils in Years 7 and 8, although such targeting in English and mathematics was much more common.
- All the schools provided additional lessons in the run up to the Year 9 tests. In some cases these were during the school day, as a result of modifications to the school timetable, but more frequently these were lunchtime or after-school sessions. Evidence from a number of the schools suggested that such out of lesson opportunities were often not utilised by the target group of pupils.

What do pupils need if they are to address this issue?

- To be aware of their areas of strength and weakness, including aspects of literacy and numeracy
- Know what they need to do to get to the next level
- Opportunities to revisit and practise and improve areas of weakness
- Access to suitable intervention materials which are tailored to their own specific needs
- Access to additional support, for example from teaching assistants or pupil mentors
- Regular reinforcement of key learning objectives and outcomes

What do teachers need if they are to address this issue?

- Strategies and systems to identify pupils' strengths and weaknesses
- Exact knowledge of what pupils need to do to get to the next level
- Appropriate use of intervention materials at the point of need
- Effective use of any additional support
- Time in lessons to allow pupils to consolidate their learning

What support can science subject leaders provide?

- Effective liaison with primary schools to identify individual pupils' strengths and weaknesses at point of entry
- A fully structured intervention programme across the key stage within normal curriculum time with clear access to all resources
- Well focused departmental/faculty meetings to share key issues and take appropriate action, including related continuing professional development (CPD)
- Schemes of work that are clearly differentiated
- Review deployment for support staff including teaching assistants and technicians
- Liaise with the senior leadership team to achieve a coherent approach to intervention across the core subjects

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