

*The following points relate particularly to children's mathematical graphics.*

**Note:** Blue font added to highlight significant points relating to issues of continuity for children's beginnings in the Foundation stage and Key Stage 1.

**Key Findings** (p.6) *including:*

- **The best teaching in both phases was enthusiastic, knowledgeable and focused clearly on developing pupils' understanding of important concepts.**
- **Good assessment throughout the lesson enabled the teacher to see how pupils were thinking and to adjust teaching and learning strategies accordingly.**
- **By developing pupils' mathematical independence, teachers also equipped them for success in examinations and beyond.**
- **Pupils wanted to do well in mathematics. They knew it was important, but were rarely excited by it, were generally not confident when faced with unusual or new problems and struggled to express their reasoning. Their recall of knowledge and techniques was stronger than their understanding.**
- Despite recent initiatives, **assessment for learning continues to be relatively weak. Most teachers did not exploit fully its potential for checking on and promoting pupils' understanding, often because of shortcomings in their subject knowledge or pedagogic skills.** Too few teachers moved around the class to check for pupils who were stuck, had made slips, or who found the work easy.
- The content of the mathematics curriculum in most of the schools surveyed was age appropriate. **However, the majority of pupils had too few opportunities to use and apply mathematics, to make connections across different areas of the subject, to extend their reasoning** or to use information and communication technology (ICT).
- **Higher-attaining pupils were not always challenged enough in lessons.** Links with other subjects were insufficient.

### **Recommendations** (p.7), *including:*

- Build on the recommendation from the Williams Review of mathematics teaching, by enhancing the role of subject leader for mathematics in primary schools so that teachers aspire to it and commit themselves to increasing the depth of subject knowledge that effective leadership demands
  - provide guidance for schools on enhancing subject expertise in mathematics
  - **devise guidance for teachers on the effective use of mathematics-specific pedagogy to aid the development of pupils' understanding**
  - **reintroduce separate reporting of pupils' attainment in 'using and applying mathematics' as part of statutory teacher assessments at the end of each key stage**; this would reflect the raised profile given to key concepts and processes in the new secondary National Curriculum
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32. Other factors include gaps in earlier learning, as well as **pupils' reliance on formal written methods and a reluctance to use informal or mental strategies which are sometimes more efficient. The best teaching gave time for pupils to think; too often, however, teachers or teaching assistants stepped in at an early stage and did the thinking for the pupil. Sometimes, pupils' passivity turned into low-level disruption and a resistance to thinking.** This was most commonly a feature of middle or low-attaining sets in secondary schools. Teachers' common strategy in these instances was to set undemanding work to keep pupils busy.

116. In the best lessons during the survey, the teachers were perceptive listeners and observers, both in interpreting pupils' responses to questions and when moving among pupils who were working on tasks and exercises. Their strong subject expertise enabled them to monitor and intervene in a timely way. **They strove to understand how each pupil was thinking and were concentrated on using this as a basis for structuring learning rather than aiming to convey a particular mathematical method. It was their focus on trying to interpret what was in pupils' minds, to help them make better sense of the mathematics for themselves, that singled out these lessons. They realised that, unless they knew how a pupil was thinking, they would not be in a position to help them learn effectively.**

### **Using and applying mathematics: pupils as mathematicians**

131. **The best practice had 'using and applying mathematics' at the heart of teaching and learning in mathematics: pupils were viewed as budding mathematicians and developing their understanding was of paramount importance. This was reflected in a shared ethos, pervading the teaching, learning and curriculum, and focused on approaches that developed**

**pupils' understanding and their independence in using and applying mathematics.** Such practice was relatively rare, although, in some schools, reflection had led to a deliberate drive towards improving pupils' understanding of mathematics – an encouraging sign.

137. The lack of development of 'using and applying mathematics' is a prime reason why pupils' understanding of mathematics lags behind their proficiency in executing techniques and recalling facts. Some primary schools and secondary departments, often well led and reflective on their practice, were introducing approaches that focused more on pupils' learning; for example, starting lessons with tasks or problems that made pupils think. The teachers encouraged discussion and debate, enabling pupils to learn for themselves and from each other. Teachers' enthusiasm was a key contributory factor. However, in nearly half the schools in the survey, provision for 'using and applying mathematics' was inadequate or barely adequate. It was generally weaker in secondary schools than in primary. In both, teachers need support and guidance in planning, teaching and assessing 'using and applying mathematics' and, thereby, in teaching for understanding.

142. **When asked, most pupils recognised the difference between just getting answers right and understanding the work. Nevertheless, many of those observed in lessons were content to have the right answers in their books when they did not know how to arrive at them. They frequently replicated steps in a method without thinking and sometimes altered answers, or waited until the teacher read them out before writing them down. This view that mathematics is about having correct written answers rather than about being able to do the work independently, or understand the method, is holding back pupils' progress.**

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