DSS Document Summary Service

GOOD PRACTICE IN PRIMARY MATHEMATICS
Evidence from 20 successful schools

A Summary of the Ofsted report, Ref. No. 110140, *November 2011*

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1. INTRODUCTION

This report follows a ministerial request for Ofsted to provide evidence on effective practice in the teaching of early arithmetic. It focuses on identifying characteristics of effective practice in building pupils' secure knowledge, skills and understanding of number so that they demonstrate fluency in calculating, solving problems and reasoning about number. The report also looks at the choices of methods pupils make when presented with calculations and problems to solve.

The report is divided into several short sections dealing with specific aspects of primary maths, and is extensively illustrated with photos, and examples of resources and children's work.

2. BACKGROUND

Inspectors visited a sample of 10 maintained and 10 independent schools, all of which have strong track records of high achievement in mathematics. Other equally successful schools which were not selected for the survey may well be able to recognise aspects of their own best practice within this report or, indeed, have some striking differences from the schools in the survey. Nevertheless, **the survey found key common factors in the ways the schools tailor their work in mathematics to meet their pupils' needs and realise their potential**. It is the cumulative effect of each school's work and the expertise of its staff that makes the difference to pupils' fluency in calculating, solving problems and reasoning about number.

Inspectors visited each school for one day during May and June 2011. Initial evidence was collected through pre-visit telephone discussions with senior staff and/or subject leaders about: the age at which pupils meet vertical addition and subtraction and methods for long multiplication and long division; the school's view of the reasons behind their pupils' success in these methods; the difficulties pupils experience and how the school overcomes them; and in what ways pupils use their arithmetic skills.

3. KEY FINDINGS

The following key findings, taken together, reflect the 'what' and 'how' that underpin effective learning through which pupils become fluent in **calculating**, **solving problems** and **reasoning about number**.

- Practical, hands-on experiences of using, comparing and calculating with numbers and quantities and the development of mental methods are of crucial importance in establishing the best mathematical start in the Early Years Foundation Stage and Key Stage 1. The schools visited couple this with plenty of opportunities for developing mathematical language so that pupils learn to express their thinking using the correct vocabulary.
- Understanding of place value, fluency in mental methods, and good recall of number facts such as multiplication tables and number bonds are considered by the schools to be essential precursors for learning traditional vertical algorithms (methods) for addition, subtraction, multiplication and division.[1]
- Subtraction is generally introduced alongside its inverse operation, addition, and division alongside its inverse, multiplication. Pupils' fluency and understanding of this concept of inverse operations are aided by practice in rewriting 'number sentences' like 3 + 5 = 8 as 8 – 3 = 5 and 8 – 5 = 3 and solving 'missing number' questions like ? – 4 = 5 by thinking 5 + 4 = 9 or 9 – 4 = 5.
- High-quality teaching secures pupils' understanding of structure and relationships in number, for instance place value and the effect of multiplying or dividing by 10, and progress in developing increasingly sophisticated mental and written methods.
- In lessons and in interviews with inspectors, pupils often chose the traditional algorithms over other methods. When encouraged, most showed flexibility in their thinking and approaches, enabling them to solve a variety of problems as well as calculate accurately.

[1] Place value is determined by the position of a digit within a number, for instance in 6135, the value of the 3 is three tens, and the 6 is six thousands. Number bonds include useful pairs of numbers, such as 1 and 9 or 3 and 7, both pairs of which add up to 10.

- Pupils' confidence, fluency and versatility are nurtured through a strong emphasis on problem solving as an integral part of learning within each topic. Skills in calculation are strengthened through solving a wide range of problems, exploiting links with work on measures and data handling, and meaningful application to cross-curricular themes and work in other subjects.
- The schools are quick to recognise and intervene in a focused way when pupils encounter difficulties. This ensures misconceptions do not impede the next steps in learning.
- Many of the schools have reduced the use of 'expanded methods' and 'chunking' in moving towards efficient methods because they find that too many steps in methods confuse pupils, especially the less able. Several of the schools do not teach the traditional long division algorithm by the end of Year 6 (age 11) and most of those that do say that a large proportion of pupils do not become fluent in it.
- A feature of strong practice in the maintained schools is their clear, coherent calculation policies and guidance, which are tailored to the particular school's context. They ensure consistent approaches and use of visual images and models that secure progression in pupils' skills and knowledge lesson by lesson and year by year.
- These schools recognise the importance of good subject knowledge and subject-specific teaching skills and seek to enhance these aspects of subject expertise. Some of the schools benefit from senior or subject leaders who have high levels of mathematical expertise. Several schools adopt whole-school approaches to developing the subject expertise of teachers and teaching assistants. This supports effective planning, teaching and intervention. Most of the larger independent preparatory schools provide specialist mathematics teaching from Year 4 or 5 onwards.