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The importance of good teaching in mathematics is well recognised both within the reports, although this is not always explicitly stated. The Ofsted (2012) report makes a number of recommendations related to teachers and teaching without ever stating the importance of good teaching. Others are more explicit, highlighting the important role of the teacher:
Teachers are absolutely key in determining whether a young person succeeds or fails in mathematics. (Vorderman, Porkess, Budd, Dunne, & Rahman-hart, 2011, p. 82).

The Select Committee explains why good teachers are important, quoting one of their witnesses as saying: "you do not teach good maths … unless you get inspirational teachers" (2012, p. 20)

It appears that there are two main causes of the mathematics problems which are directly related to teachers. First, there is a shortage of specialist mathematics teachers and second, teacher knowledge is sometimes limited; there is much within the reports to imply that poor or inadequate teaching is the cause of much of the mathematics problem.

The report on TIMMS 2011 explains that, for their report, 'a 'subject specialist' is defined as likely to have an academic qualification in the subject taught, whereas a teacher who has studied mathematics or science education may have studied the pedagogy of mathematics or science but may not have an academic qualification in the subject.' (Sturman, Burge, Cook, & Weaving, 2012, p. 138).

Retention of specialist teachers is a further concern (Burghes, 2011, 2012; Harris, 2012; Science Learning Centre, 2013; Vorderman et al., 2011). *Retention is as important as recruitment, particularly in STEM subjects, for which many alternatives to teaching are available. (Science Learning Centre, 2013, p. 4).*

The extent of the problem is outlined by Burghes (2012) who explains that 'the turnover is high given that approximately 2,500 new secondary mathematics teachers are trained each year yet there are only about 12,000 secondary mathematics teachers in the maintained sector'(p. 4). Burghes goes on to suggest why it is so difficult to retain specialist mathematics teachers, mentioning factors

that might attract teachers away from teaching and factors that might 'push' teachers away from the classroom.

As a further result of the shortage of specialist teachers, large numbers of mathematics lessons are taught by non-specialists (ACME, 2012; Ofsted, 2012; Parliamentary Office of Science and Technology, 2013; Science Learning Centre, 2013; Vorderman et al., 2011). The problem, it seems, is that non-specialist teachers are unlikely to have in-depth subject knowledge and by implication their teaching is, in the words of Ofsted, 'weaker'.

Lack of subject knowledge of teachers of mathematics is frequently cited as a reason for the problems in mathematics. One group of teachers concerned is the group of non-specialists who teach in secondary schools, referred to above. The second group is made up of the majority of primary school teachers (ACME, 2011a; Royal Society, 2011; Vorderman et al., 2011). For both these groups, the key instrument for assessing or measuring mathematical knowledge seems to be the highest formal qualification of the teacher (ACME, 2011a; Royal Society, 2011; Vorderman et al., 2011). For example:

The quality of the mathematical knowledge of teachers remains an important influence. The majority of entrants to the profession have only a GCSE Grade C as their highest mathematical qualification. (Burghes, 2012, p. 4)

As far as the secondary teachers are concerned, ACME outlines an explanation about why the lack of specialist knowledge causes problems:

Lack of specialist knowledge can also make it harder for teachers to understand the connections and relationships between key mathematical ideas. This makes mathematics harder to learn for many learners, because they do not have the opportunity or the required knowledge to make sense of fragments of mathematical information within the broader context of mathematics and its applications. (2011b, p. 18)

The reports suggest that, because of the difficulty of some mathematical concepts, teachers need to plan the multiple ways in which students will experience these concepts, but that teachers often lack the knowledge needed to develop an appropriate curriculum.

It also seems that for some teachers, their knowledge of mathematical methods is tacit, and they tend to assume that students understand in the same way. (AlphaPlus Constulancy, 2012).

There are a number of areas in which particular mathematical knowledge seems to be lacking: the use of digital technologies (Clark-Wilson, Oldknow, & Sutherland, 2011), engineering (Finegold, 2011) and personal finance education (All Party Parliamentary Group on Financial Education, 2011). Interestingly, although the report by Porkess et al (2012) shows some concern about the teaching of statistics, it does not suggest that teacher knowledge in statistics is lacking. On the other hand, trainee teachers in England reported that statistics was one of the top topics in which they lacked confidence (Burghes, 2011).

For primary school teachers, similar problems are described. It is suggested that, along with a lack of subject knowledge, goes a lack in confidence (Royal Society, 2011; Vorderman et al., 2011). Importantly, this may mean that they tend to accept methods and advice from a range of bodies, because they do not have the confidence to evaluate these. (Vorderman et al., 2011). Teachers' lack of skills and confidence is also given as a reason for the fact that 'many children do not enjoy a truly stimulating introduction to these subjects [mathematics and science]' (Royal Society, 2011, p. 46).

Where teaching is given as a reason for the problems in mathematics, it seems that the overall main concerns are that the mathematics curriculum is experienced by students as an unconnected set of topics and it is taught in as routine and procedural ways. Whereas some of the more complex areas of mathematics such as problem solving, modelling, investigation and reasoning are seen as important and valuable, it the ways in which schools frequently organise their teaching is to spend less time on these areas than may be needed so that they can spend more time on routine procedures which are easier to measure and test. It is argued that the approaches which are often privileged in classrooms are over-simplified and mechanistic and that students do not benefit mathematically from these. (ACME, 2011a, 2011b; Norris, 2012; Ofsted, 2012; Vorderman et al., 2011).

A further concern is that teachers sometimes fail to take into account the prior knowledge of children, meaning not only that the more able pupils do not extend their learning but also that those with less developed skills are not building on solid foundations. (Ofsted, 2012; Vorderman et al., 2011)

A key reason given for these approaches to teaching is that teachers tend to 'teach to the test', which can be at odds with approaches that privilege developing students' understanding between and within topics (ACME, 2011a, 2011b; AlphaPlus Constulancy, 2012; Morgan, 2011; Noyes, Drake, Wake, & Murphy, 2011; Ofsted, 2012; Smithers, 2013; Vorderman et al., 2011). For example, as Ofsted states:

There is too much short- term focus on teaching to, and practising of, GCSE examination-style questions. Attention to understanding is all too often replaced by memorising and replicating the steps in a method. (2012, p. 76)

A further concern about the teaching of mathematics relates to the use of resources, both paper based and digital. In terms of paper-based resources, it is recognised that '[t]extbooks and published schemes have the potential to influence teachers' interpretation of the curriculum very extensively' (ACME, 2013, p. 13), but that many of those in current use (and potentially in development) tend to emphasise routine and procedural skills, and in particular those needed to pass examinations at the expense of the development of conceptual understanding (ACME, 2011b, 2013; Vorderman et al., 2011). In terms of digital resources, it seems that 'the use of technology within mathematics is underused and, where it is used, its potential is generally underexploited' (Clark-Wilson et al., 2011, p. 6).

The ways in which schools organise the teaching of mathematics is sometimes seen as causing problems in mathematics education. One cause cited is the practice of 'setting' in schools, with students in the lower attaining sets experiencing different teaching approaches, engaging less in mathematics and developing a lower sense of self-worth as mathematicians than those in higher sets. (ACME, 2011b)

It may seem obvious that professional development would be crucial in addressing the problems identified in the reports relating to teacher subject and pedagogic knowledge above. Many of the reports recommend that subject specific professional development should be available to teachers of mathematics (see 'Recommendations' section) but as ACME says, 'the necessity and opportunity to undertake funded study of mathematics knowledge and pedagogy are limited in ITE and CPD' (2011b, p. 22). This can perhaps be seen as one of the major causes of the limited teaching, which is in itself a cause of the symptoms of the problems in mathematics.

It is generally recognised that transition from primary to secondary schools, and from secondary to Higher Education, can be difficult for students. It seems from the reports, that students experience discontinuities in mathematical coverage, which

means either re-covering concepts already met or missing key concepts altogether (ACME, 2011b; Noyes et al., 2011; Vorderman et al., 2011). It appears that one of the reasons for this is a lack of information about the knowledge and understanding of individual students (ACME, 2011b; Noyes et al., 2011). As ACME says:

Qualifications and records of coverage do not provide teachers with enough knowledge to ensure continuity for all learners. (2011b, p. 15)

In English schools, accountability (performance tables and inspections) has increased in recent years (Ofsted, 2012). A number of reports refer to accountability policies or measures in explaining why there is a tendency in schools to teach to the test (or to the C grade at GCSE), avoiding innovative teaching approaches, and using methods that are unlikely to lead to anything more than superficial learning (ACME, 2011a, 2011b, 2012; Harris, 2012; NFER, 2013; Noyes et al., 2011; Royal Society, 2011; Science Learning Centre, 2013; Smithers, 2013). As the report from the Science Learning Centre explains:

Performance measures influence behaviour, and schools will focus on what is being measured, but current accountabilities struggle to capture the richness of a truly excellent STEM education. This can result in uninspiring STEM teaching, with over emphasis on learning facts at the expense of stimulating curiosity or applying scientific principles. As a result, young people may become disengaged from STEM, with little desire to continue it further. (2013, p. 8).

In addition to national accountability measures, it seems that increasingly planning and teaching are micro-managed at local and national levels and that this has somehow influenced teaching in classrooms in negative ways (ACME, 2011b; Vorderman et al., 2011). This micro-management has the effect of 'replacing professional judgement with sets of boxes to be ticked, providing criteria against which people and institutions can be judged and, in many cases, targets can be set (Vorderman et al., 2011, p. 21).

Overall, perhaps, current policies have led a situation where the balance of control between the end-users of school mathematics (employers and HE) and the administrators in government offices is out of kilter. Vorderman et al (2011) suggest that, whereas in the past, students and teachers had more of an influence over school mathematics, control is now located at governmental administrative level, largely controlled by people who do not understand the unique requirements of mathematics.