

Secondary Mathematics Teaching for Mastery: Some themes and key principles

This document is an attempt to distil some important aspects of what teaching for mastery at Key Stages 3 and 4 might look like, and results from ideas generated during the planning of the secondary Mastery Specialist programme and discussions with the teachers taking part in the programme during 2016-2017.

The intention is to stimulate debate and discussion rather than to offer a definitive definition or set of strategies.

- Mathematics teaching for mastery rejects the idea that a large proportion of people 'just can't do maths'. All students are encouraged by the belief that by working hard at mathematics they can succeed and that making mistakes is to be seen not as a failure but as a valuable opportunity for new learning.
- Facility with procedures and algorithms without a deep and connected understanding does not constitute mastery. Mastery is achieved through developing procedural fluency and conceptual understanding in tandem, since each supports the other.
- Lessons are designed to have a high-level of teacher-student and student-student interaction where all students in the class are thinking about, working on and discussing the same mathematical content. Challenge and the opportunity to deepen understanding of the key mathematical ideas is provided for all.
- Every attempt is made to keep the whole class learning together. Differentiation is achieved, not through offering different content, but through paying attention to the levels of support and challenge needed to allow every student to fully grasp the concepts and ideas being studied. This ensures that all students gain sufficiently deep and secure understanding of the mathematics to form the foundation of future learning before moving to the next part of the curriculum sequence. This prevents students from being left behind.
- For those students who grasp ideas quickly, acceleration into new content is avoided. Instead, these students are challenged by deeper analysis of the lesson content and by applying the content in new and unfamiliar problem-solving situations. If some students fail to grasp an important aspect of the lesson, this is identified quickly and early intervention ensures that they are ready to move forward with the whole class in the next lesson.
- Lesson design identifies the new mathematics that is to be taught, the key points, the difficult points and a carefully sequenced learning journey through the lesson. In a typical lesson, the teacher facilitates whole-class interactive discussion, including active debate and argument based around the tasks offered. Through teacher-student and student-student interaction the teacher encourages demonstration, explanation, exploration, analysis and generalisation (leading to proof where appropriate).
- It is recognised that practice is a vital part of learning, but the practice is *intelligent* practice that aims to, develop students' conceptual understanding and encourage reasoning and mathematical thinking, as well as reinforcing their procedural fluency.
- Teachers use well-crafted examples and exercises which, through careful use of variation (including what to keep the same) focuses students' attention on the key learning point.
- Teachers use carefully chosen examples of key mathematical ideas and concepts (including models, images and diagrams) which emphasise 'what it is' (both standard and non-standard examples) and 'what it is not'.

- Significant time is spent developing a deep understanding of the key ideas and concepts that are needed to underpin future learning. The structures and connections within the mathematics are emphasised, which helps to ensure that students' learning is sustainable over time.
- Key facts such as number facts (including multiplication tables), formulae and relevant theorems, as well as key algebraic techniques, are learnt and practiced regularly in order to avoid cognitive overload in the working memory. This helps students to focus on new ideas and concepts.