What is Maths Mastery?

Teaching maths for mastery is a transformational approach to maths teaching which stems from high performing Asian nations such as Singapore. When taught to master maths, children develop their mathematical fluency without resorting to rote learning. They are able to solve non-routine maths problems without having to memorise procedures.

When looking for a maths mastery approach, you should consider the following elements.

1. Representations

The Concrete, Pictorial, Abstract (CPA) approach was developed by Jerome Bruner and it introduces all mathematical concepts and ideas in a concrete, tangible and realistic way first. Then pupils move on to understand the idea using pictorial representations (number bonds, ten frames, bar models etc), before moving to the abstract symbols or problems.

It allows children the potential to access the content with a deep understanding, so they feel confident to manipulate the ideas in further learning. It is a highly effective approach to teaching and can be used to introduce all new topics to all pupils, not just those that are struggling.

The CPA approach aims to have all pupils understanding the conceptual ideas behind the abstract mathematics.

2. Class structure

Traditionally in the UK, children were put into groups and given different content based on their anticipated ability. This means that from an early age children are classed as those who can and those who can't "do maths". Teaching maths for mastery is different because it offers all pupils access to the full maths curriculum. This inclusive approach helps to build self-confidence and resilience in pupils.

When teaching maths, using one lesson plan, to the whole, mixed-ability class, rather than separating ability groups, allows pupils the chance to think and explore the topics at a greater depth rather than being left behind or accelerated on to the next topic. It encourages team-work and collaboration, and children are able to establish peer-to-peer teaching meaning they are developing advanced skills to communicate the ideas of the lesson.
It is changing the atmosphere in the classroom where failure and struggle are not taboo words. In fact, children are exploring, discovering and debating the mathematical ideas. But

also maths is no longer the topic that people just can't do, actually every pupil can have the confidence to think of themselves as a mathematician.

3. Mathematical thinking

Maths lessons are structured differently with one problem (the anchor task) being the centre of the whole lesson. Then the lesson is split up into sections, each part interacting with the anchor task in a different way. This allows pupils to not just passively receive the information, but to actively work through the problem-solving stages to really analyse the problem and ideas at hand.

Zoltan Dienes' theory emphasises the need for pupils to learn first through informal exploration before moving to more formal, structured learning. So following this theory, children collaboratively explore the lesson's problem first with no intervention from the teachers, before moving to a guided, teacher-led discussion. It is allowing pupils to have time to think deeply about the maths and really understand concepts at a relational level rather than as a set of rules or procedures. Additionally, the discussions encourage children to debate the topic and build on each other's thinking, meaning they are developing healthy communication and collaboration skills.

Additionally, if children are given the opportunity to journal during a maths lesson they are learning to articulate their ideas and explicate their mathematical thinking that surfaced during their exploration of the anchor task. They are able to justify their reasoning, rather than that information being stuck in their head.

We want to encourage an open environment where learners feel safe to explore new ideas and if they feel confident to make their journals completely personal, it can be a great tool for assessing their mathematical thinking.

3. Fluency

Fluency in mathematics is the ability to complete mathematical problems accurately and efficiently, and having the confidence and ability to flexibly manipulate mathematical concepts. Some children will acquire this skill with quick recall of number facts and a strong procedural understanding, whereas others will achieve the same results with a deep conceptual understanding. Therefore in maths mastery, it is important that pupils are exposed to both and see problems solved using multiple methods.

If pupils are given ample time to study the topics in greater depth rather than being accelerated onto the next concept, they will be able to understand not only what they need to do to solve a problem but also why they are doing it. This will result in them developing the skills to become both procedurally and conceptually fluent.

Finally, a varied and frequent practice of increasingly complex problems, will help pupils to develop their conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

4. Variation

Variation can be seen in both the anchor tasks and the problems given to pupils to practice their learning. Anchor tasks have been designed to give pupils multiple opportunities to revisit the core concepts, with the benefit of seeing concepts in more than one way but never repeating a lesson or question. Each time a lesson revisits an idea, it will dig deeper into that concept allowing children to build up a solid understanding.

Practice questions have been designed for intelligent practice. Pupils are not just learning through repetition they are experiencing variation. And it's more than just mathematical variation, where we vary the numbers used, but it is variation of skills and approaches needed to solve the problems. We are also seeing variation in the amount of assistance given to the learners, where scaffolded tasks can be followed by less-scaffolded tasks.

5. Coherence and small steps

The lessons are centred around one anchor task allowing pupils to consider it more thoroughly, without rushing. This slower pace leads to a greater progress, ensuring pupils are secure in their understanding and without building on misconceptions.

In one chapter on one topic, you can see the theory building and the ideas getting more complex. At each stage, introducing different methods to solve problems, allowing pupils to pick what works for them. If they are struggling with today's method, it doesn't mean they have failed because they will have the knowledge and the confidence that they can solve the problem in another way, from another lesson.

A spiral-approach programme allows pupils and teachers to look at topics in smaller chunks and revisit them later, building on that previously-learned, thorough knowledge.

All these elements work to allow children to make important and intriguing connections within mathematics; rather than having to be taught them, they discover them.