



Rationale

'Pure mathematics is, in its way, the poetry of logical ideas.'

Albert Einstein

Intent

Whole class moves through content at the same pace

When teaching maths for mastery, the whole class moves through topics at broadly the same pace. Each topic is studied in depth and the teacher does not move to the next stage until all children demonstrate that they have a secure understanding of mathematical concepts.

Time to think deeply about the maths

Students are given time to think deeply about the maths and really understand concepts at a relational level rather than as a set of rules or procedures. This slower pace leads to greater progress because it ensures that students are secure in their understanding and teachers don't need to revisit topics once they've been covered in depth.

Builds self-confidence in learners

In a traditional primary school maths lesson, children are put in different 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 can't "do maths". Teaching maths for mastery is different because it offers all pupils access to the full maths curriculum. This inclusive approach, and its emphasis on promoting multiple methods of solving a problem, builds self-confidence and resilience in pupils.

Differentiates through depth rather than acceleration

Though the whole class goes through the same content at the same pace, there is still plenty of opportunity for differentiation. Unlike the old model, where advanced learners are accelerated through new content, those pupils who grasp concepts quickly are challenged with rich and sophisticated problems within the topic. Those children who are not sufficiently fluent are provided additional support to consolidate their understanding before moving on.

Basis for the 2014 National Curriculum For Maths

Teaching maths for mastery is a key plank of the Government's education reforms and is reflected in the 2014 English national curriculum for mathematics. The NCETM, Department for Education and OFSTED have all endorsed this evidence-based approach which is a key part of the work within the Maths Hubs Programme.

Concrete, Pictorial, Abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths in pupils. Often referred to as the concrete, representational, abstract framework, CPA was developed by American

psychologist Jerome Bruner. It is an essential technique within the Singapore method of teaching maths for mastery.

Background to the CPA framework

Children (and adults!) can find maths difficult because it is abstract. The CPA approach builds on children's existing knowledge by introducing abstract concepts in a concrete and tangible way. It involves moving from concrete materials, to pictorial representations, to abstract symbols and problems. The CPA framework is so established in Singapore maths teaching that the Ministry of Education will not approve any teaching materials that do not use the approach.

Concrete step of CPA

Concrete is the "doing" stage. During this stage, students use concrete objects to model problems. Unlike traditional maths teaching methods where teachers demonstrate how to solve a problem, the CPA approach brings concepts to life by allowing children to experience and handle physical (concrete) objects. With the CPA framework, every abstract concept is first introduced using physical, interactive concrete materials. For example, if a problem involves adding pieces of fruit, children can first handle actual fruit. From there, they can progress to handling abstract counters or cubes which represent the fruit.

Pictorial step of CPA

Pictorial is the "seeing" stage. Here, visual representations of concrete objects are used to model problems. This stage encourages children to make a mental connection between the physical object they just handled and the abstract pictures, diagrams or models that represent the objects from the problem.

Building or drawing a model makes it easier for children to grasp difficult abstract concepts (for example, fractions). Simply put, it helps students visualise abstract problems and make them more accessible.

Abstract step of CPA

Abstract is the "symbolic" stage, where children use abstract symbols to model problems. Students will not progress to this stage until they have demonstrated that they have a solid understanding of the concrete and pictorial stages of the problem. The abstract stage involves the teacher introducing abstract concepts (for example, mathematical symbols). Children are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols (for example, $+$, $-$, \times , $/$) to indicate addition, multiplication or division.

Implementation

How is arithmetic taught and supported at Neston?

The daily maths lesson taught using Maths No Problem at Neston is also supplemented with the Fluent in 5 resource from Third Space Learning.

Fluent in Five provides a daily set of arithmetic practice for Years 1-6, designed to help children develop and maintain fluency in both written and mental calculations. The structure of Fluent in Five is also designed to help Key Stage 2 children distinguish between written and mental calculations.

The approach behind Fluent in Five:

Regular practice of mental and written arithmetic skills is important in order to keep calculation skills fresh. This is especially important given the way the curriculum is taught – with longer blocks spent on each topic area, and less focus on revisiting topics.

Children and schools also repeatedly report of the strict time limits affecting performance in the Key Stage 1 and Key Stage 2 Arithmetic Tests, with many children in Key Stage 2 not being able to complete the full test in the time given.

This is often because children are attempting questions which have been designed to be answered mentally using an informal or formal written method, which takes up valuable time. Sometimes, this occurs when children are not familiar with suitable mental approaches to calculations, or because they are simply 'tricked' by the appearance of a gridded working out area after each question.

Fluent in Five has been designed to provide both regular practice right from the start of Key Stage 1, along with – in Key Stage 2 – helping children to distinguish between mental and written methods. This ultimately develops a child's ability to complete all the questions in an arithmetic test in the limited time that they are given.

Ideally children should complete the Fluent in Five challenge each day. In Key Stage 2, we aim for 4 afternoons per week owing to the timetabling of PPA. The resource can be delivered using between 10 and 15 minutes of class time.

As a guide:

- 5 minutes – Children complete the Fluent in Five Challenge. The teacher and any support staff use this time to look at how children are approaching the questions and begin to identify any misconceptions or common errors.
- 3 minutes – Where possible, children self-mark their challenge sheet. In Year 1 especially, it may be that answers need to be marked by an adult. The teacher takes feedback about the range of answers and identifies any common misconceptions.
- 2 to 5 minutes – The teacher completes any quick teaching/re-caps focusing on any common misconceptions.

Impact

Ongoing formative assessment of maths skills and knowledge is vital.

Summative assessments take place twice a year and are made up of the following tests from Rising Stars Assessment:

Assessment and Monitoring in Maths:

The children complete Rising Star 'Optional Tests' summative assessments in January and June. The assessments are used to inform teaching and learning and to identify weaknesses in individuals and the class. These are reviewed by teachers and subject leaders in follow up pupil progress meetings. The subject leader identifies whole school weaknesses and incorporates them into subject action plans. The June tests help to inform teacher judgements based on end of year age-related expectations (ARES).

The impact of our Maths curriculum is measured through the monitoring cycle in school, lesson observations, book monitoring and learning walks.