

CPA Approach

The CPA Approach



CONCRETE -
using physical objects
to solve maths problems.

PICTORIAL -
using drawings
to solve maths problems.

ABSTRACT -
solving maths problems
using only numbers.

What is the Concrete Pictorial Abstract in Maths?

The Concrete Pictorial Abstract (CPA) approach is a system of learning that uses physical and visual aids to build a child's understanding of abstract topics.

Pupils are introduced to a new mathematical concept through the use of concrete resources (e.g. fruit, Dienes blocks etc). When they are comfortable solving problems with physical aids, they are given problems with pictures – usually pictorial representations of the concrete objects they were using.

Then they are asked to solve problems where they only have the abstract i.e. numbers or other symbols. Building these steps across a lesson can help pupils better understand the relationship between numbers and the real world, and therefore helps secure their understanding of the mathematical concept they are learning.

The CPA maths model in Teaching for Mastery

The concept of 'mastery' was first proposed in 1968 by Benjamin Bloom. At this time the phrase 'learning for mastery' was used instead. Bloom believed students must achieve mastery in prerequisite knowledge before moving forward to learn subsequent information.

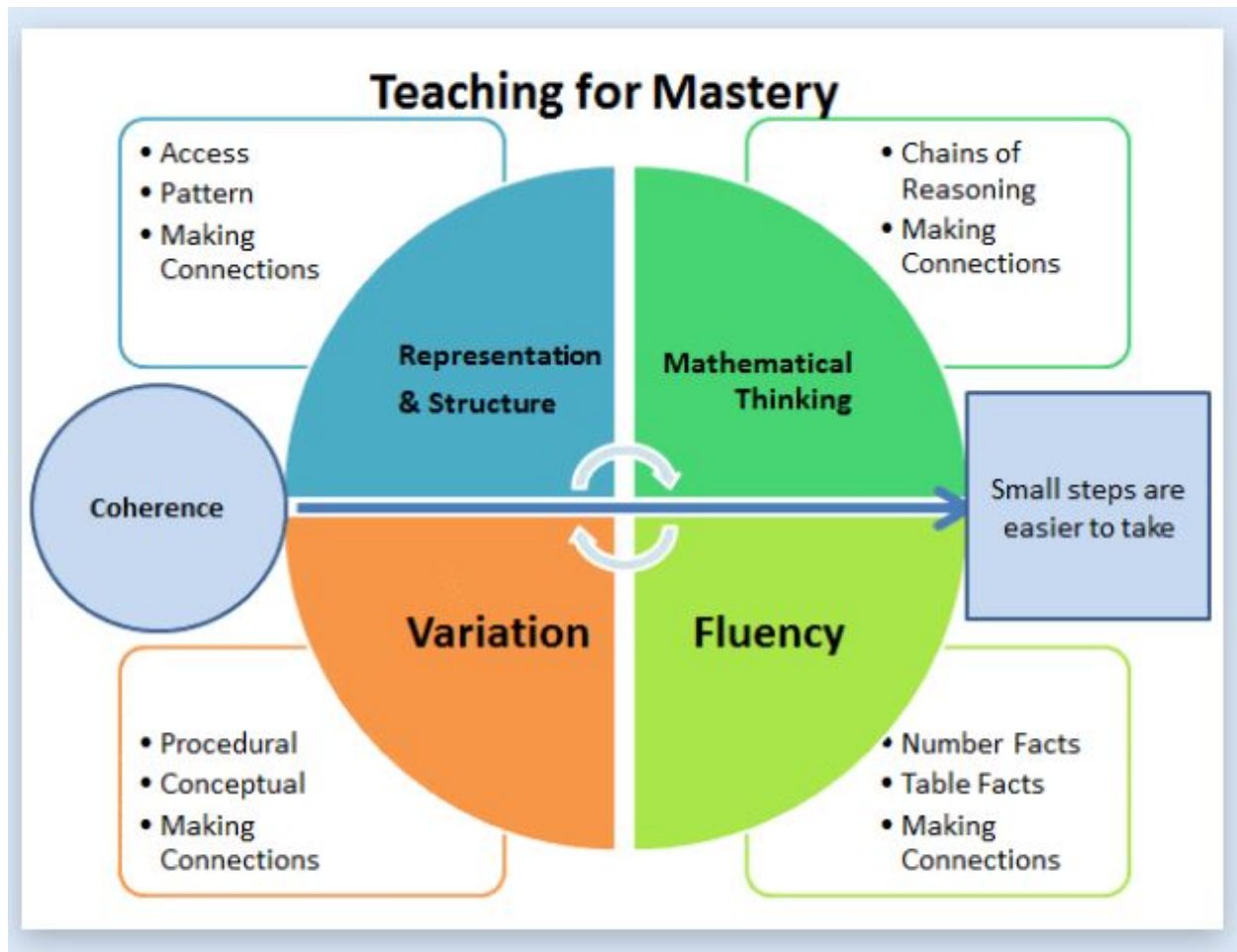
Bloom suggested that if learners don't get something the first time, then they should be taught again and in different ways until they do.

Jerome Bruner and Concrete Pictorial Abstract

Looking more specifically at the origins of the CPA approach, we again need to go back to the teaching methods of the 1960s, when American psychologist Jerome Bruner proposed this approach as a means of scaffolding learning.

He believed the abstract nature of learning (which is especially true in maths) to be a 'mystery' to many children. It therefore needs to be scaffolded by the use of effective representations and [maths manipulatives](#).

He found that when pupils used the CPA approach as part of their mathematics education, they were able to build on each stage towards a greater mathematical understanding of the concepts being learned, which in turn led to information and knowledge being internalised to a greater degree.



Why use the Concrete Pictorial Abstract approach in Maths?

Pupils achieve a much deeper understanding if they don't have to resort to rote learning and are able to solve problems without having to memorise.

When teaching reading to young children, we accept that children need to have seen what the word is to understand it. Putting together the letters c- a- t would be meaningless and abstract if children had no idea what a cat was or had never seen a picture.

People often don't think of this when it comes to maths, but to children many mathematical concepts can be equally meaningless without a concrete resource or picture to go with it. This applies equally to mathematics teaching at KS1 or at KS2.

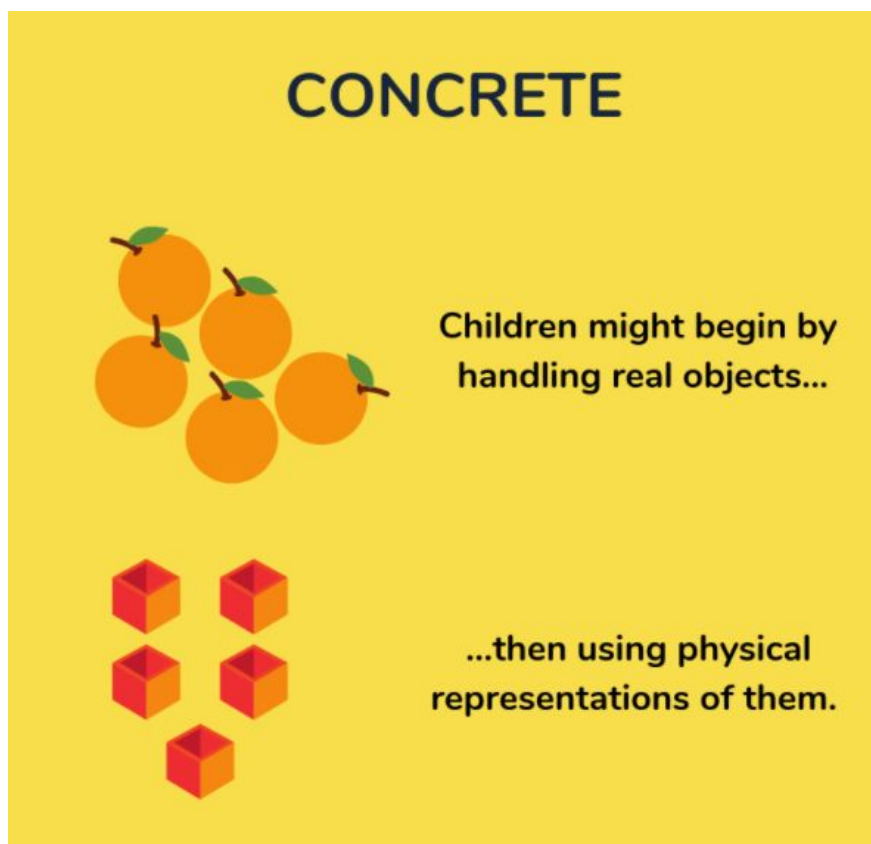
What is a 'Concrete' representation in the CPA approach?

As part of the CPA approach, new concepts are introduced through the use of physical objects or practical equipment. These can be physically handled, enabling children to explore different mathematical concepts. These are sometimes referred to as maths manipulatives and can include ordinary household items such as straws or dice, or specific mathematical resources such as dienes or numicon.

The abstract nature of maths can be confusing for children, but through the use of concrete materials they are able to 'see' and make sense of what is actually happening.

Previously, there has been the misconception that concrete resources are only for learners who find maths difficult. In fact concrete resources can be used in a great variety of ways at every level. All children, regardless of ability, benefit from the use of practical resources in ensuring understanding goes beyond the learning of a procedure.

Practical resources promote reasoning and discussion, enabling children to articulate and explain a concept. Teachers are also able to observe the children to gain a greater understanding of where misconceptions lie and to establish the depth of their understanding.



What is a 'Pictorial' representation in the CPA approach?

Once children are confident with a concept using concrete resources, they progress to drawing pictorial representations or quick sketches of the objects. By doing this, they are no longer manipulating the physical resources, but still benefit from the visual support the resources provide.

Some teachers choose to leave this stage out, but pictorial recording is key to ensuring that children can make the link between a concrete resource and abstract notation. Without it, children can find actually visualising a problem difficult.

One of the most common methods of representing the pictorial stage is through the [bar model](#) which is often used in more complex multi step problem solving.

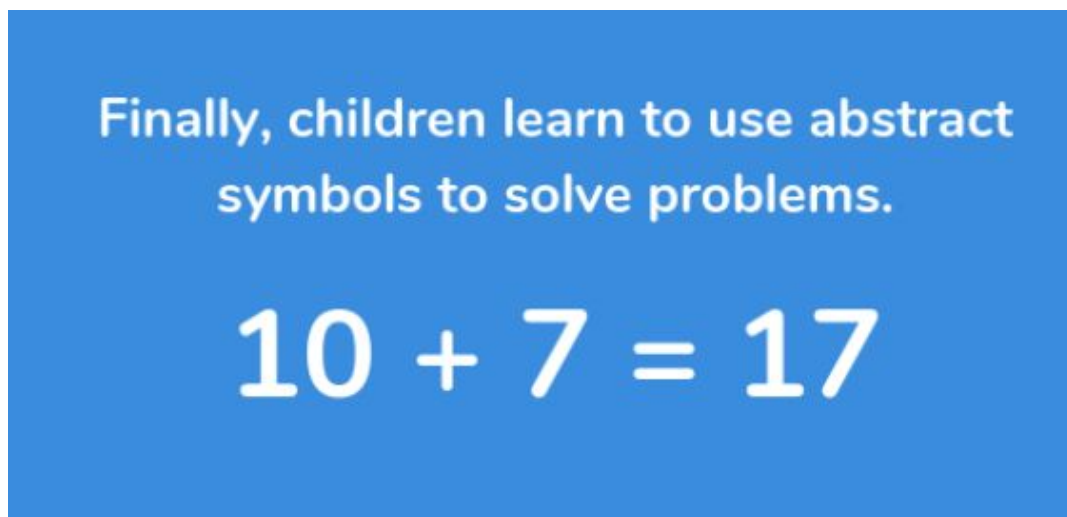
PICTORIAL

Drawings act as a bridge between the concrete objects children have been using and the abstract symbols they must learn to use.

What is an 'Abstract' representation in the CPA approach?

Once children have a secure understanding of the concept through the use of concrete resources and visual images, they are then able to move on to the abstract stage. Here, children are using abstract symbols to model problems – usually numerals. To be able to access this stage effectively, children need access to the previous two stages alongside it.

For the most effective learning to take place, children need to constantly go back and forth between each of the stages. This ensures concepts are reinforced and understood.



How to teach using the Concrete Pictorial Abstract method at primary school

A common misconception with this CPA model is that you teach the concrete, then the pictorial and finally the abstract. But all stages should be taught simultaneously whenever a new concept is introduced and when the teacher wants to build further on the concept.

When concrete resources, pictorial representations and abstract recordings are all used within the same activity, it ensures pupils are able to make strong links between each stage.

