



Ideas for Depth of Understanding

'Many children are trained to do calculations rather than being educated to think mathematically' (Noyles, 2007 pg.11)

So how do we avoid teaching procedures and get pupils to develop a 'deep understanding' in mathematics?

Mathematics Mastery uses the three key principles to deepen pupils' understanding.

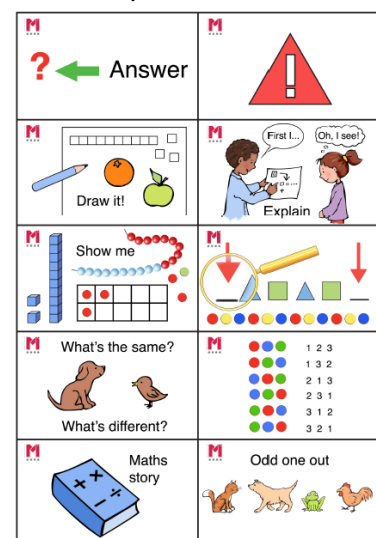
Pupils' conceptual understanding is developed through the use of multiple concrete and pictorial representations. Indeed a key part of a 'deep understanding' in maths is being able to represent ideas in lots of different ways. Pupils use different concrete objects and pictures to represent abstract concepts. This helps pupils to make connections between representations, identifying what aspects are the same and which are different.

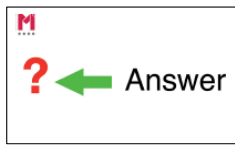
Depth of understanding is also developed through pupils' communication about maths using the correct mathematical language. Being asked to explain, justify and prove their ideas deepens a pupil's understanding of a concept.

Another way to develop a depth of understanding is to encourage pupils to think mathematically. We can do this by providing lots of opportunities for pupils to investigate carefully planned open questions that get them to sort and compare, seek patterns and look for rules. Pupils also need to develop as active mathematicians, we need to provide opportunities for them to ask questions and create their own problems to explore. This is a great way to develop deep understanding but it also fosters curiosity and creativity in mathematics.

We have developed ten ideas that challenge pupils to develop a depth of understanding within a concept, rather than moving them on to a new objective.

Each of the ten ideas is represented by a picture or symbol. The idea being that, after introduction, the tasks can be easily identified by pupils without the need for instruction. From the top, left to right, each of the ideas is explained below.



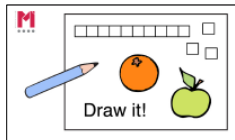


'What's the question?'

If this is the answer, what could the question have been? This could be an equation or a word problem.



'What's wrong with this?' Can you explain what is wrong with this and correct the error?



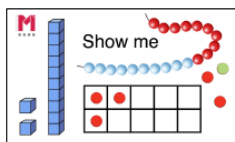
'Draw it'

Draw a picture to explain or demonstrate what you have worked out



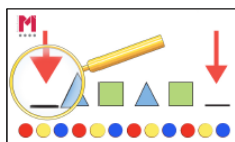
'Reason it'

Explain to your partner how you know. Remember to use the star words!



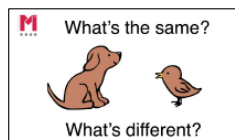
'Show me!'

Convince me that you are right.



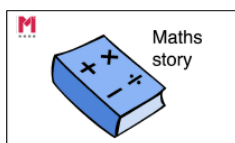
'Find a pattern'

Can you see a pattern (in the numbers)? Can you see a pattern in the answers? Continuing this pattern, what would happen if...? What came before? What comes next? Explain how you know



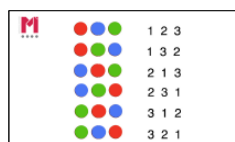
'What's the same? What's different?'

Can you find anything that is the same about these two numbers/shapes/calculations? Now can you find something that is different?



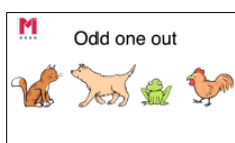
'Maths story'

Make up a real-life story using your equation/numbers or shapes. Try to use the star words.



'Have you found all possibilities?'

Is there more than one way of completing this? Is there more than one answer? Have you found them all?



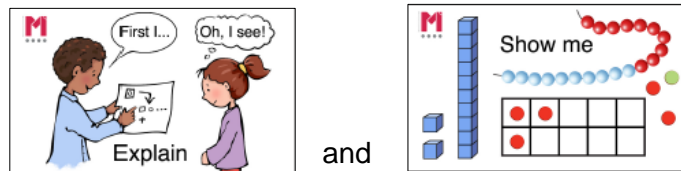
'Odd one out'

Find an odd one out and explain why it doesn't fit. Does your partner agree with you? Could another one be the odd one out? Why?



The images can be used in a variety of ways, for example:

- To provide a partner talk activity during whole class learning (inserting the appropriate image with a question on the interactive whiteboard slide).
- The ideas could be incorporated into task sheets or used as an Independent Task, displayed on the whiteboard.
- Once pupils are familiar with all the tasks, they could be created as laminated cards. Pupils can then self-select a card to challenge themselves.
- They could be printed on stickers and used as 'next steps' in pupils' books .
- They could be used as visual success criteria. For example, "Today I am looking for you to..."



- Evidencing differentiation through depth can also be a challenge. These symbols could also be evidence of how differentiation has been achieved through depth rather than by content.

These prompts provide some starting ideas for activities in mathematics that promote and develop a deep understanding of concepts. We encourage you to share your ideas for developing depth with your colleagues or when networking with other partner teachers. Ongoing collaborative working and professional dialogue have been shown to be key aspects of effective professional development (Cordingley et al., 2003).