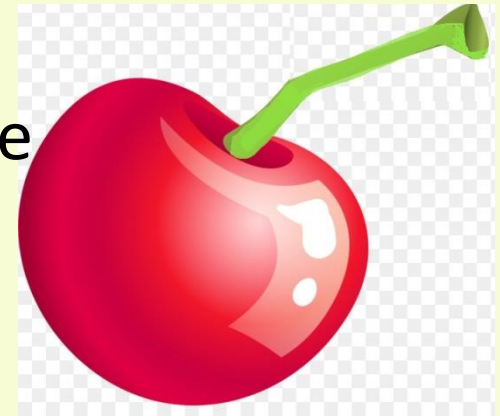


Making Maths Mastery Work for SEND



(Explode the Myths and Make
the most of the Marvels)



SEND Conference

Wednesday 24th October 2018

Presenters:

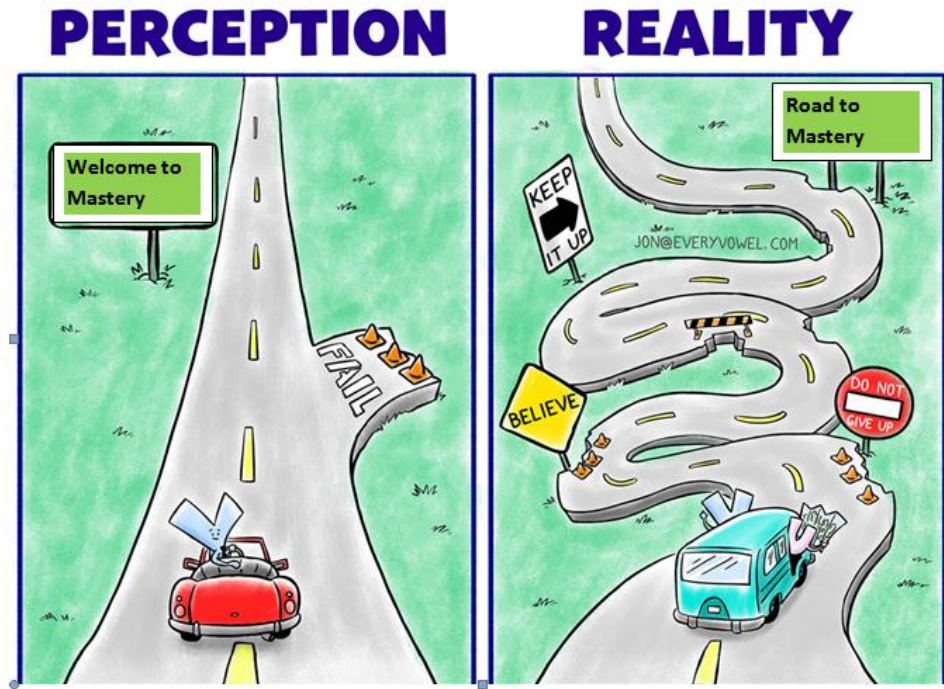
Helen Ball and Liz Coleman

Aims

This workshop aims to :

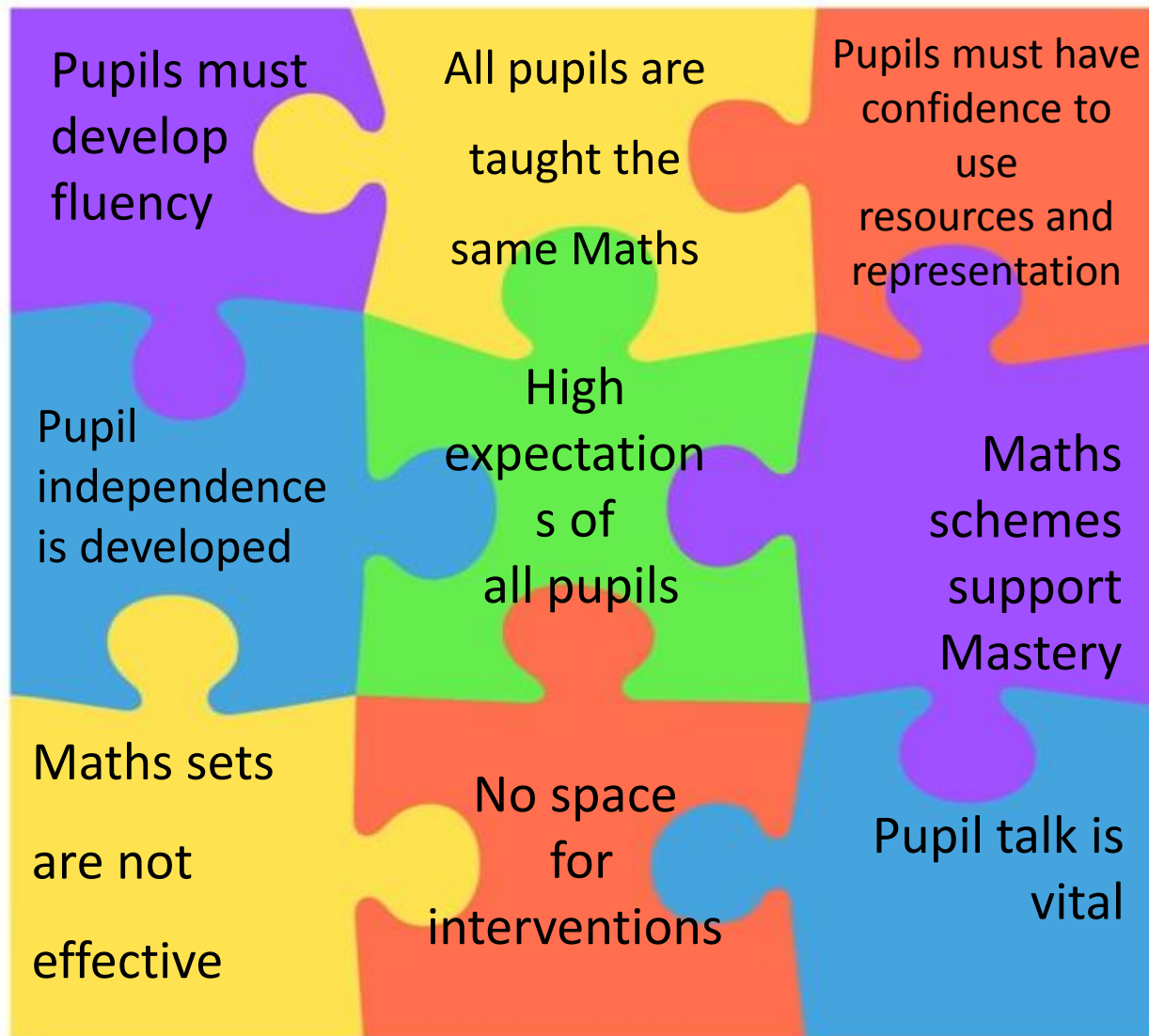
- look at the main principles of Maths Mastery
- Discuss what is meant by fluency
- Discuss how mastery works for SEND
- Dispel some math's mastery myths

Maths for Mastery



What happens in your school now?

Math's Mastery – Myth or Marvel?



The National Curriculum and Mastery

‘The 2014 national curriculum for mathematics has been designed to raise standards in maths, with the aim that the large majority of pupils will achieve mastery of the subject.’ Oct. 2014

It is a mastery curriculum.

Maths for Mastery

Inspired by teaching approaches developed in Singapore and Shanghai, mastery is an inclusive way of teaching that is grounded in the belief that all pupils can achieve in maths. A concept is deemed mastered when learners can represent it in multiple ways, can communicate solutions using mathematical language and can independently apply the concept to new problems. (TES)

Maths for Mastery

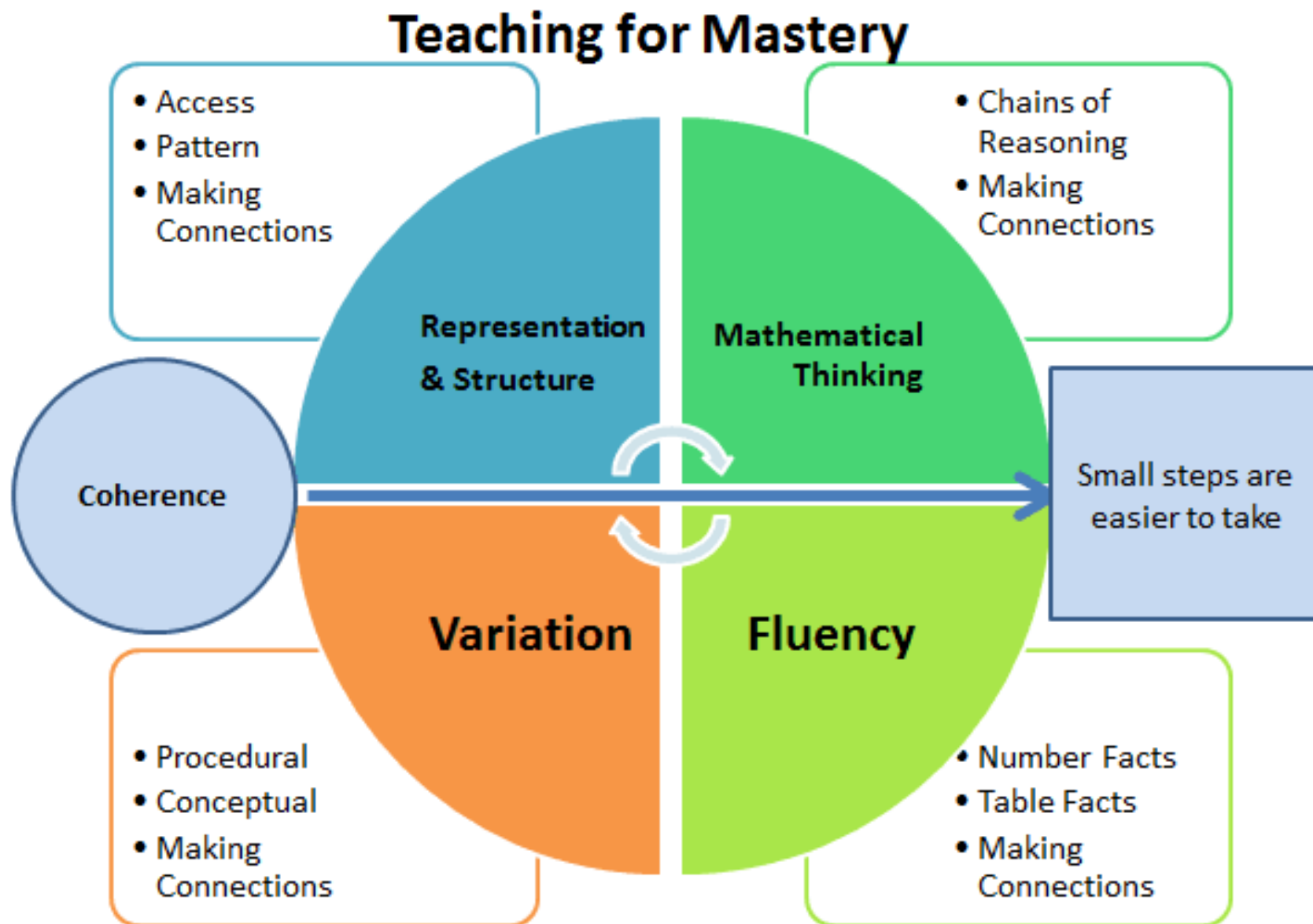
Mastery is a teaching approach. To fully teach mastery, so that it is effective and inclusive, schools must invest in high quality CPD for staff to develop their understanding of the research, science and reasoning behind the methodology.



Maths for Mastery

“A pupil has SEN where their learning difficulty or disability calls for special educational provision, namely provision different from or additional to that normally available to pupils of the same age. Making higher quality teaching normally available to the whole class is likely to mean that fewer pupils will require such support”. SEN COP 2015 6.15

The 5 Big Ideas



Some People have maths brains.



**Myth or
Marvel?**



Some People have maths brains.

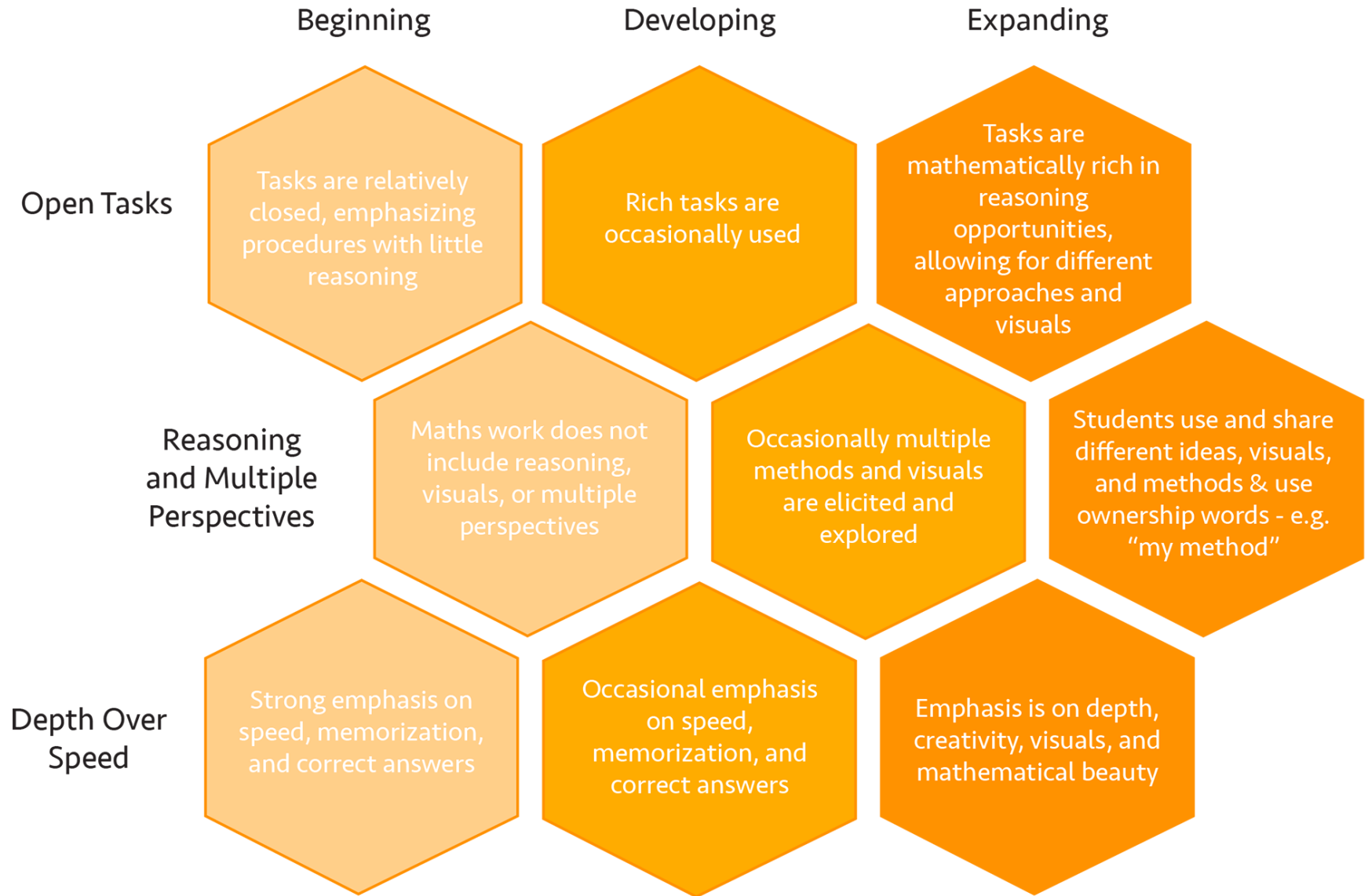


Maryam Mirzakhani, first female and Iranian winner of the Fields Maths Medal

Some People have maths brains.

The ancient art of mathematics, Tao has discovered, does not reward speed so much as patience, cunning and, perhaps most surprising of all, the sort of gift for collaboration and improvisation that characterizes the best jazz musicians. Tao now believes that his younger self, the prodigy who wowed the math world, wasn't truly doing math at all. "It's as if your only experience with music were practicing scales or learning music theory," he said, looking into light pouring from his window. "I didn't learn the deeper meaning of the subject until much later."

A Positive Maths Mindset



Fluency or Fluent Recall?

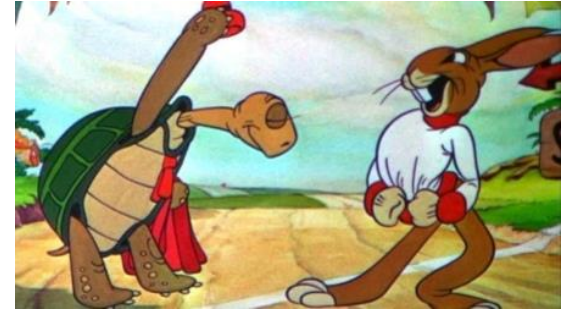
Pupils should be able to recall and apply mathematical knowledge both rapidly and accurately.

However, it is important to stress that fluency often gets confused for just memorisation – it is far more than this. As well as **fluency of facts** and **procedures**, pupils should be able to:

move confidently between contexts and representations,
recognise relationships and make connections in
mathematics.

Fluency or Fluent Recall?

Faster students are better at Maths?



“I was and still am rather slow. I need time to seize things because I always need to understand them fully. Towards the end of 11th grade I secretly thought of myself as stupid. I worried about this for a long time.”

Laurent Schwartz

(Winner of Fields Maths Medal)



Fluency or Fluent Recall?

Teachers should help pupils develop a deep conceptual understanding of the subject. Frequent, carefully designed, intelligent practice will help them to achieve a high level of fluency.

Quick recall does not mean better understanding.

Pupils who make connections for themselves experience deeper learning.

Not: this is how you do it but this is why you do it!

Fluency or Fluent Recall?

“We practice fluency through chanting – but we link this to layers of practical equipment. ...We ask questions such as ‘How are you going to represent this?’”

(Year 1 Teacher Great Barr)

15

fifteen



Everyone does the same?

The expectation is that the **majority** of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.



Everyone does the same?



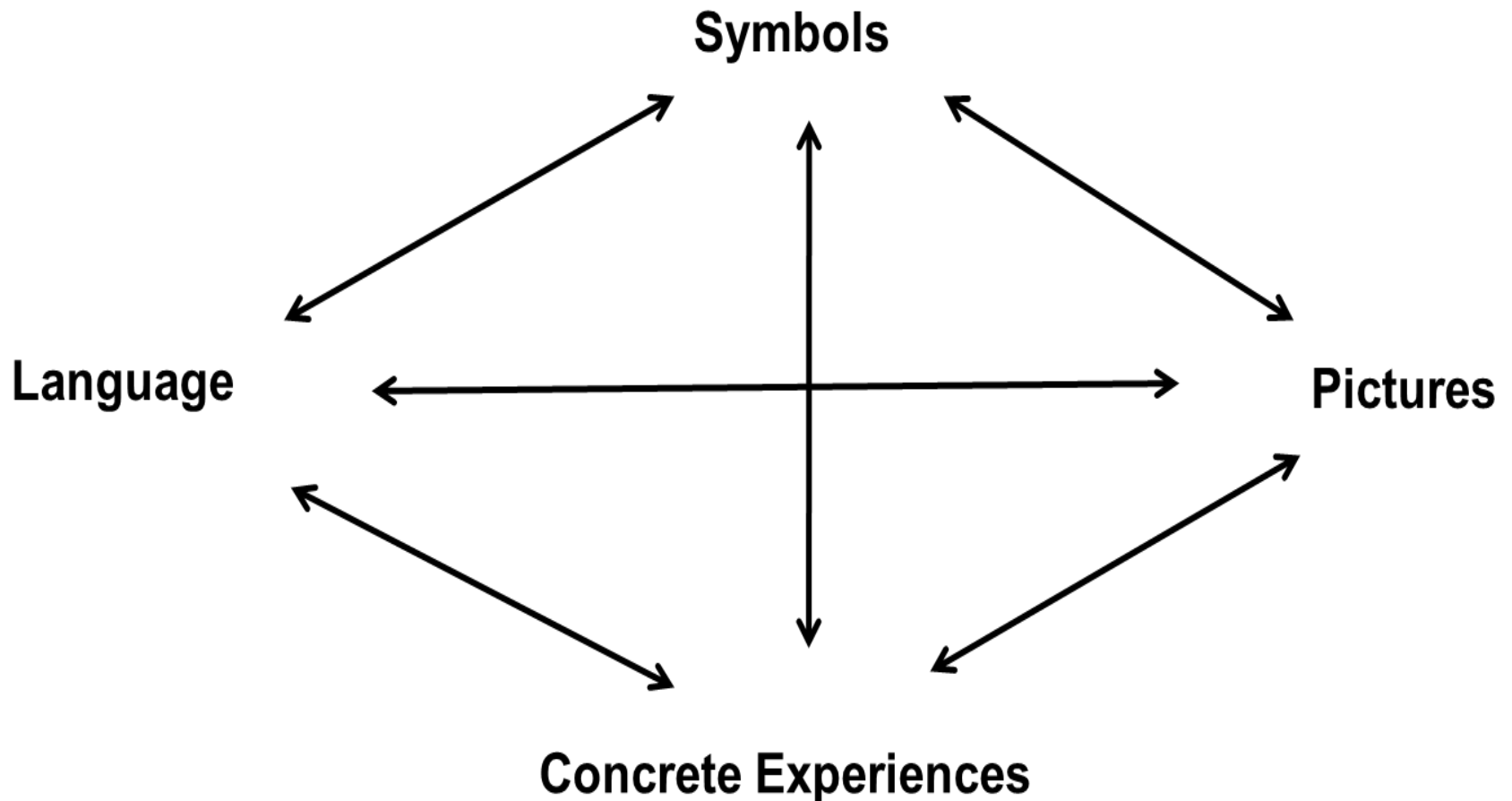
Scaffolding may be through resourcing, representations, questioning, the sequence of learning ... but it needs to be a well thought out approach which supports independence.

Teachers must have a solid understanding of the concept they are teaching and identify the barriers (stumbling blocks) which need to be overcome for pupils to gain knowledge.

The teacher must be clear of the pathway of that a pupil may take so that they can scaffold learning. And consider the questions needed to promote learning and overcome misconception.

Scaffolding Learning

Haylock and Cockburn (2008)



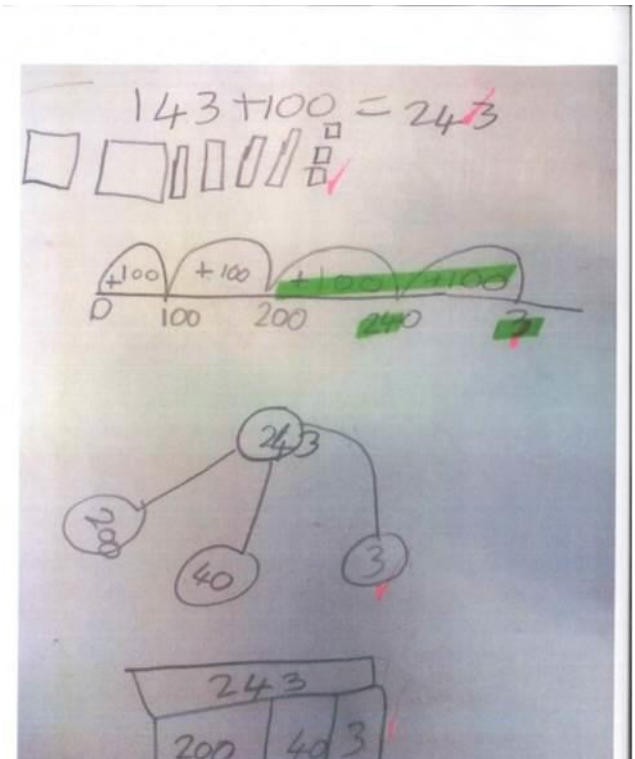
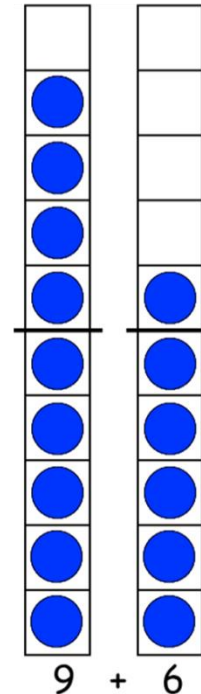
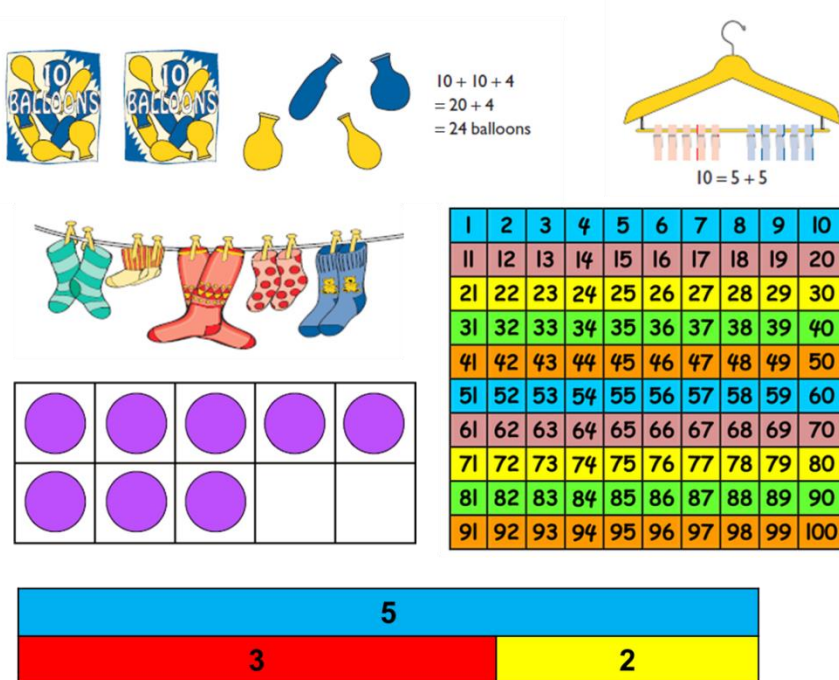
Concrete, Pictorial, Abstract

Evans (2017) continued:

“...there doesn't have to be a linear progression from concrete to pictorial to abstract. Instead, teachers should apply a cyclical approach. For example, even when a pupil has worked out the answer using an abstract method, it is worth asking them to use concrete manipulatives to convince others that they are correct.”

Visual Models and Representations

The word 'representation' is used 21 times in the National Curriculum.



Making Connections

Which set of questions would support pupils conceptual thinking and of how numbers relate?
Why?

Set A

$$120 - 90$$

$$235 - 180$$

$$502 - 367$$

$$122 - 92$$

$$119 - 89$$

$$237 - 182$$

Set B

$$120 - 90$$

$$122 - 92$$

$$119 - 89$$

$$235 - 180$$

$$237 - 182$$

$$502 - 367$$

Making connections

Using these strategies promotes :

- Flexibility in thinking and the search for patterns and relationships.
- Moves basic fact mastery from low level thinking skills (rote memorization) to high level thinking skills (problem solving and analysis)
- Learners to move away from 'I don't know' as a response to an unknown situation to, 'I don't know, but I can figure it out.'

The Number System and Numbersense

Number at the heart. Secure the fundamentals.

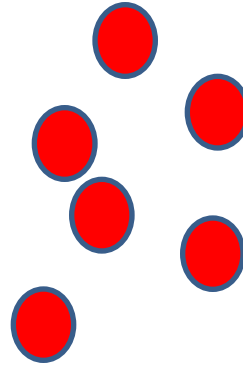
A large proportion of time is spent reinforcing number to build competency and fluency.

“Look for connections and relationships within maths. Look for the easy ways....often only the higher attainers find the easy ways because they work them out for themselves. Research by Tall and Gray says that our lower attainers are doing the harder maths. They are using the most inefficient ways.”

(Debbie Morgan)

Number Sense

What is 6?



What is a thousand, a million.....



Number Sense

Common difficulties with :-

- Estimating
- Composition of number
- Assessing difference in numerical quantity, eg. understanding that 230 is ten times as much as 23 or that 9 is larger than 7
- Understanding and using mathematical symbols
- Understanding place value, eg. being able to write 304 in response to hearing three hundred and four rather than writing 3004
- Placing numbers on a number line, ie. Understanding that 5 would be placed in the middle of a number line between 0 and 10
- Making connections between operations

The Number System and Numbersense

‘Many teachers think that if children can partition numbers into tens and ones then they understand this concept. This is not necessarily the case. There are four aspects of number value that children need to understand. These are:

Tens	Ones
10	1
2	7

- Positional: The digit 2 is in the tens position and the digit 7 is in the ones
- Multiplicative: The digit 2 is two tens (10×2) which is 20, the digit 7 is seven ones (1×7) which is 7

- Additional: combine the two numbers to make the whole by addition $20 + 7 = 27$

Base10: the value of the digits increase or decrease by the power of 10 as they get bigger or smaller’

Numbersense

Activity:

$$2000 - 87 =$$

All pupils can achieve

“I didn’t used to like maths... but I like it now. I can get to use practical resources to help me. We have a box of resources on the table in all our maths lessons – and some pictures too – so I can use them when I need to. It helps me to understand.”

Year 5 boy, Quinton

All pupils can achieve?

“Six per cent of our sample had persistent, severe difficulties with mathematics. About half of the children with an SLDM profile had some form of language or communication difficulty. Some of these children also had a diagnosis of autism, social, emotional, and behavioural difficulties or attention deficit and hyperactivity disorder.”

Research from Queens University Belfast 2018

Next Steps

- Join a Maths Hub
- Visit NCTEM website for training videos and resources.
 - Invest in training and resources
 - Use Maths Toolkit for SEND pupils
- Ask your PSS teacher about the maths training packages

Any Questions?



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Pupil and School Support



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Partners on the pathway to a positive future for children and young people