

# Teacher Research Groups as a successful Professional Development model

Helen White and  
Rebecca Westcott  
*Teaching for Mastery  
Specialists*



National Centre  
for Excellence in the  
Teaching of Mathematics



**MathsHUBS**

# What is a TRG?

- Teacher research group – study teaching and improve practice collaboratively
- Powerful CPD because teaching staff are engaging in meaningful discussion to develop pedagogy for mastery
- A lesson observation provides a common focus for discussion
- Originates from the teaching observations and discussions in Shanghai

# Format

- Prior to the lesson: contextualising remarks, lesson outline
- Observation: collaborative, part of a joint professional learning journey
- Discussion: structured, focussing on the maths (Five Big Ideas)
- Each teacher leaves with a plan to try something particular in their own class

# The Five Big Ideas

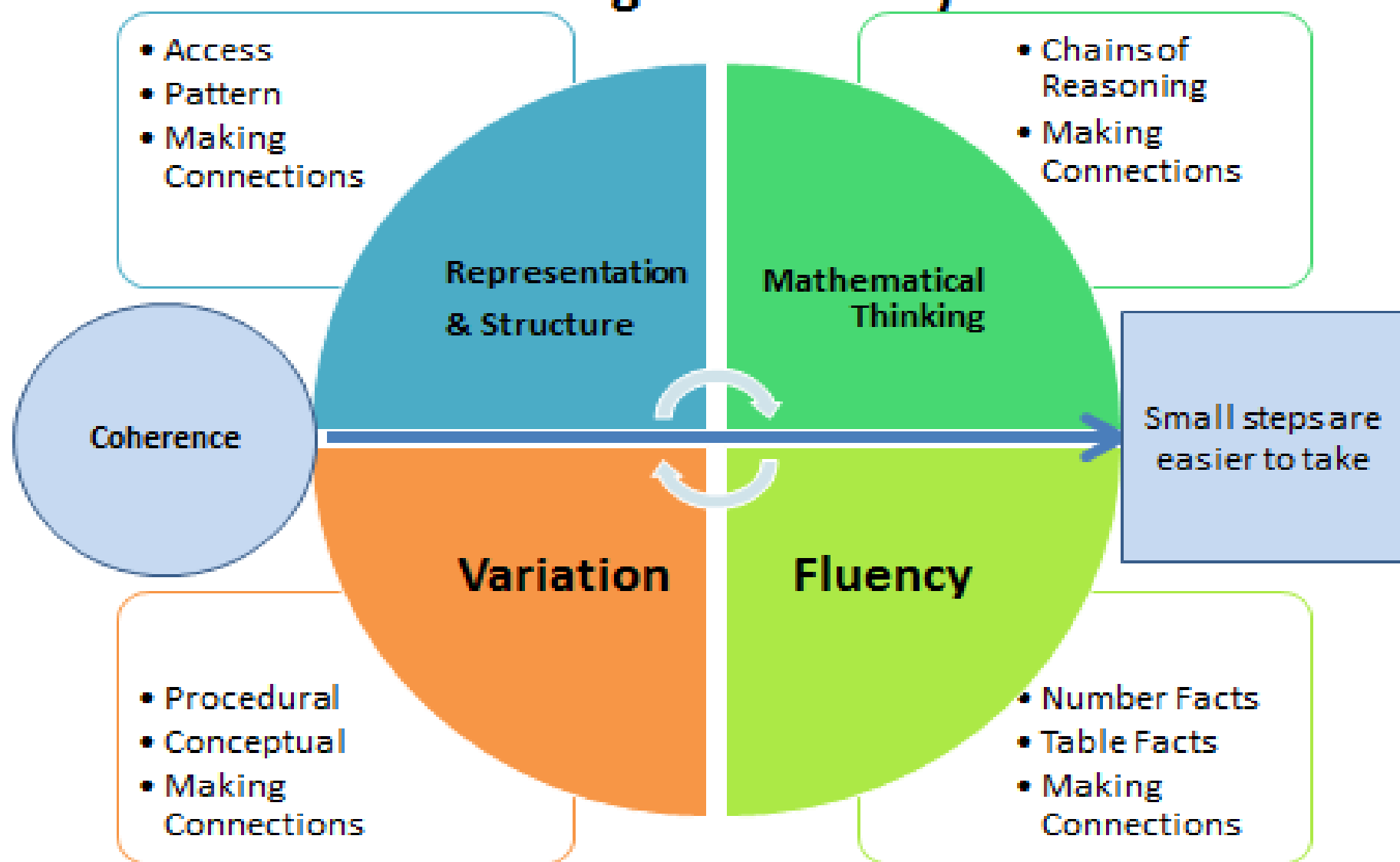


National Centre  
for Excellence in the  
Teaching of Mathematics



**MathsHUBS**

# Teaching for Mastery



# Representation and Structure

*Mathematical tools should be seen as supports for learning. But using tools as supports does not happen automatically. Students must construct meaning for them. This requires more than watching demonstrations; it requires working with tools over extended periods of time, trying them out, and watching what happens. Meaning does not reside in tools; it is constructed by students as they use tools (p. 10).*

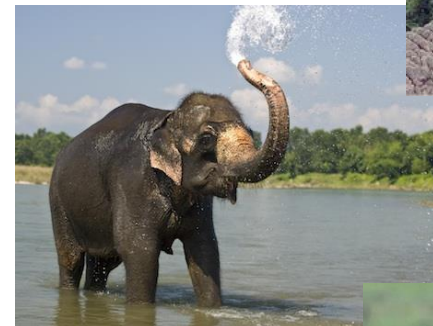
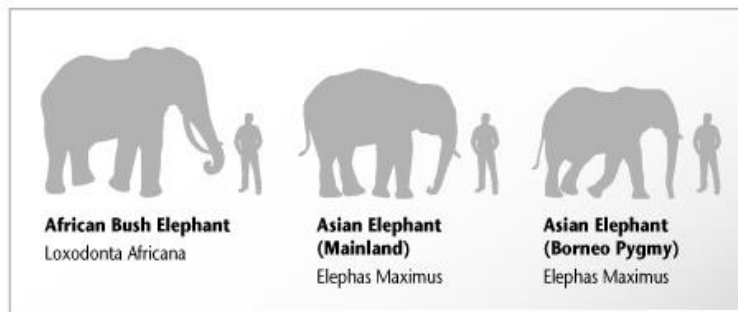
.(Hiebert 1997) Cited in Russell (May, 2000). *Developing Computational Fluency with Whole Numbers in the Elementary Grades*

[http://investigations.terc.edu/library/bookpapers/comp\\_fluency.cfm](http://investigations.terc.edu/library/bookpapers/comp_fluency.cfm)

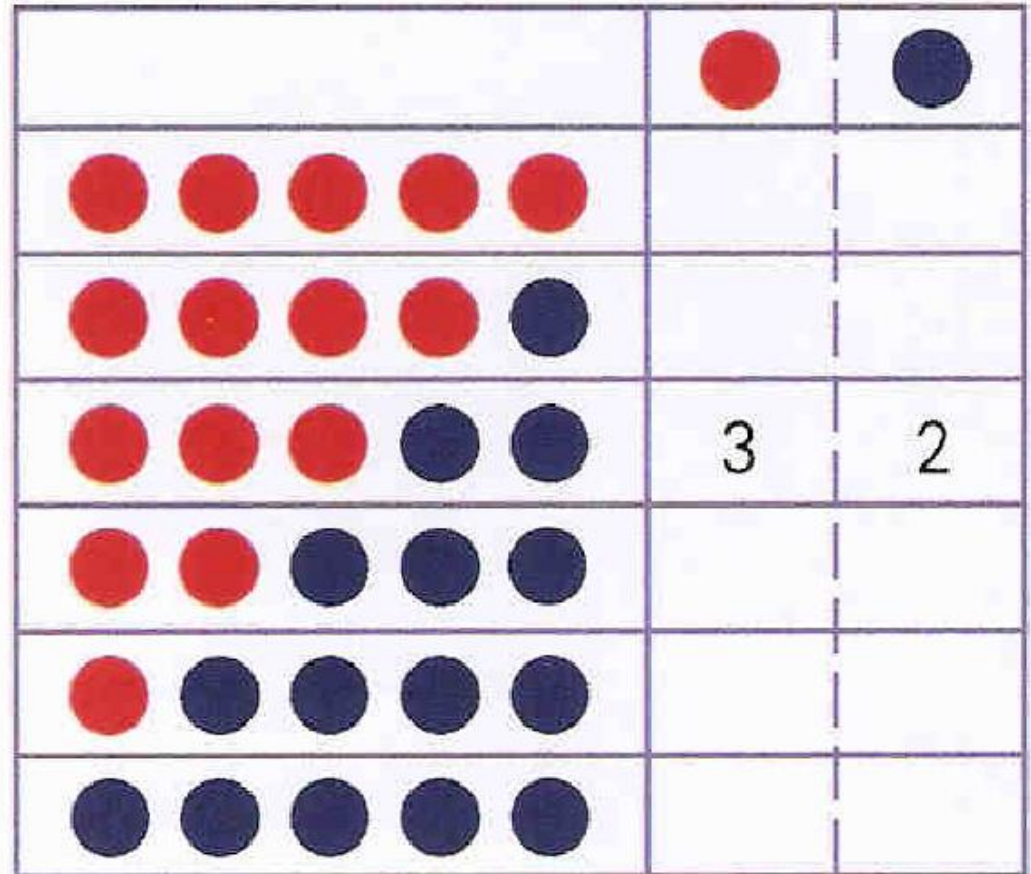




# ●Representation/structure







# Remembering and structure

When procedures are accompanied by even a minimal appreciation of the mathematical structures which make them effective and which provide criteria for appropriateness, learning shifts to focusing on re-construction based on re-remembering (literally) rather than relying totally on photographic or rote memory.

(Mason 2010)

# Variation versus Variety

## Variety

- 'Pick and mix'
- Most practice exercises contain variety

## Variation

- Careful choice of WHAT to vary
- Careful choice of what the variation will draw attention to

# ● What is being varied and why? MathsHUBS

$2 \times 3 =$

$6 \times 7 =$

$9 \times 8 =$

$2 \times 30 =$

$6 \times 70 =$

$9 \times 80 =$

$2 \times 300 =$

$6 \times 700 =$

$9 \times 800 =$

$20 \times 3 =$

$60 \times 7 =$

$90 \times 8 =$

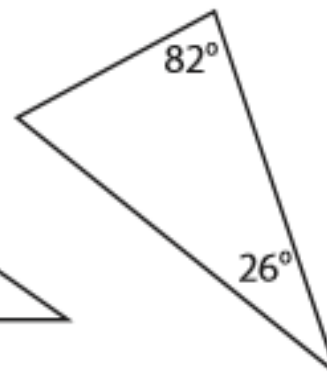
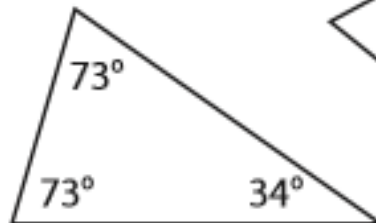
$200 \times 3 =$

$600 \times 7 =$

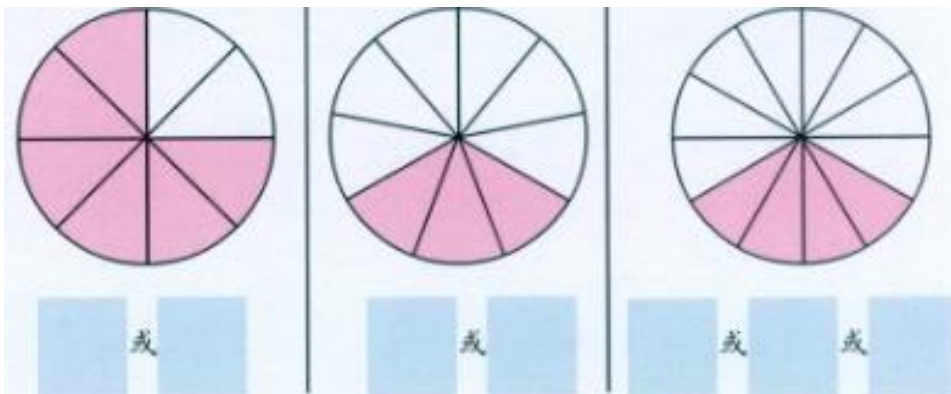
$900 \times 8 =$

Which of these triangles are isosceles?

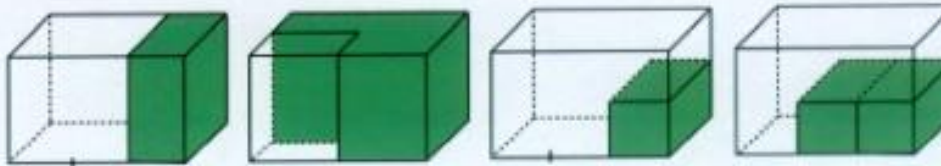
Explain your decisions.



# Conceptual Variation



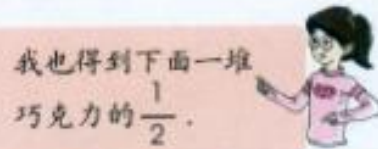
2 绿色部分是长方体的几分之几？用分数表示。



他们得到的巧克力一样多吗？



我得到下面一堆巧克力的  $\frac{1}{2}$ 。



我也得到下面一堆巧克力的  $\frac{1}{2}$ 。



# What is fluency?

- Quick recall of facts and procedures
- The flexibility and fluidity to move between different contexts and representations of mathematics.
- The ability to recognise relationships and make connections in mathematics



# How fluent are you at solving these?

$$8 + 4 = \square + 5$$

$$68 - \square = 59 - 38$$

$$48 \times 2.5 = \square \times 25$$

$$39 \div 3 = 3.9 \div \square$$

Consider the strategies you used

# Mathematical **T**hinking

*It is central to mathematics learning; the glue that both develops and holds mathematics learning together*

It involves:

Looking for pattern and relationships

Logical Reasoning

Making Connections

# Observation and Discussion



National Centre  
for Excellence in the  
Teaching of Mathematics

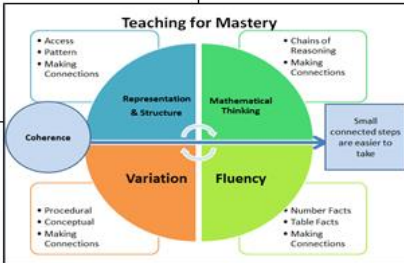


**MathsHUBS**

# East Midlands South

Name - \_\_\_\_\_ Date - \_\_\_\_\_

Notes from Observation - TRG East Midlands South



The diagram illustrates the 'Teaching for Mastery' framework. It is centered around four quadrants: Representation & Structure (top-left, blue), Mathematical Thinking (top-right, green), Variation (bottom-left, orange), and Fluency (bottom-right, green). A central circle with a double-headed arrow connects these quadrants. Surrounding these are four boxes: 'Access, Pattern, Making Connections' (top-left), 'Chains of Reasoning, Making Connections' (top-right), 'Procedural, Conceptual, Making Connections' (bottom-left), and 'Number Facts, Table Facts, Making Connections' (bottom-right). A box on the right states 'Small connected steps are easier to take'.

Features of a lesson

Teaching the whole class together

Small steps

Precise use of mathematical language

Speaking in full sentences

Opportunities for children to go deeper

Analysis of strategies


Discussion

Variation - concepts

Variations – procedural

Small focus

Misconceptions addressed and planned for



## Lesson Record Focus: Teaching for Mastery

School	Date	Observer
Year	Class size	
Main focus of lesson (Overall theme' and 'Key point')		
Summary of the structure of the lesson		
Comments on particular features		
Features (you may wish to add others of your own that you notice)	Examples	Reflection/Comment
<b>Intelligent Practice</b> Intelligent practice is used to focus on: - developing conceptual understanding (use of concrete resources, pictorial representations, abstract (CPA)) - avoiding mechanical repetition - practising the thinking process with increasing creativity		
<b>Conceptual variation</b> Opportunities to focus on: - What it is - What it's not (use of mistakes and misconceptions)		
<b>Procedural variation</b> Opportunities for: - Solving problems (routine and non-routine) - Applying to different contexts - Making connections		
Teaching the whole class together		
Precise use of mathematical language		
Opportunities to go deeper		
Possible solutions shared, explained and discussed to deepen understanding. The answer is only the beginning		

# GLOW

# Let's Try One Now...



National Centre  
for Excellence in the  
Teaching of Mathematics



**MathsHUBS**

# Y3 Multiplication Lesson



<https://www.ncetm.org.uk/resources/48211>



# Post-Lesson Discussion

- What struck you about the lesson?
- What did you notice?
- Where did the lesson start, where did it go to and where did it end?
- Focus on one of the ‘big ideas’. For example variation – any examples of procedural/conceptual variation - what was their value?

# Post-Lesson Discussion

- How were particular features of the lesson supporting the children to learn the mathematics?
- What scaffolding was there that allowed all the children to engage? Did this work?
- What challenges were there in the lesson to extend and deepen the thinking. Did this work?
- What aspects of the mathematics did the children find challenging. How was this addressed and/or how could it be addressed?

# Post-Lesson Discussion

- How would what you saw influence your practice?
- Strategies / techniques / ideas to try in your own lessons:
- Strategies / techniques / ideas to discuss with other teachers in your own school:

# Getting Involved in TRGs



National Centre  
for Excellence in the  
Teaching of Mathematics



**MathsHUBS**

# TRG Opportunities

- Shanghai Exchange Programme – teachers currently visiting Mangotsfield Primary School
- NCETM Teaching for Mastery Specialists – 6 schools per specialist, 6 TRG sessions over the year
- In school – assembly time, lesson in staff meeting, NCETM online videos

# Running a TRG

- Consider the focus of your lesson observation
- What small, coherent steps do you want to show?
- How are the five 'big ideas' apparent? Are you focussing on a particular one?
- How will children be challenged and supported through questioning and tasks?



# Some other Mastery Specialists' views on TRGs



*‘I have found participation in a TRG to be an incredibly positive and enriching experience. It has really helped get to the heart of what works in terms of children's mathematical learning and development.’*

**Vicky Morris, St Nicholas and St Laurence CE Primary School,  
Weymouth**

*‘Planning and chairing the TRGs has been really powerful CPD. The five schools in my group thought it would just be about their development, but the process has deepened my own understanding of mastery and has raised issues I'd not considered previously. It has made me look at my own practice through new eyes.’*

**Helen Hackett, Parkfield Community School/Maths Academy,  
Birmingham**

# Some other Mastery Specialists' views on TRGs



*'The process of TRGs has been an extremely positive one. The discussions we share have become increasingly detailed and show a growing understanding and appreciation of the core elements of a mastery approach. I am astounded by the progress that has been made in all the schools in our group over such a short time!'*

**Martin Adsett, Swindon Village Primary School**

*'Having less of a focus on a 'finished article' the discussions in TRG meetings have been less judgemental than they might have been, which in turn has made them more open, reflective and deep.'*

**Katie Mallinson, Millbrook School, Grove, Oxfordshire**