

Making an impact on the National Maths Hubs as a National Teaching Fellow



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GOVERNMENT
Statutory National Curriculum for Maths

NCETM <https://www.ncetm.org.uk/>
(National Centre for The Excellence of Teaching of Mathematics)
Funded by government **to support**
primary and secondary maths in schools

35 National Maths Hubs (since 2014)
Funded by NCETM to provide support to primary and
secondary schools in regions across UK
<http://www.mathshubs.org.uk/>

A main focus of the National Maths Hubs ...



A National focus on:
Shanghai Exchange Programme
(2014- current day)

WHY?



TIMSS (Trends in International Mathematics and Science Study)

63 Countries: Children aged 10-14

'East Asian countries continue to lead the world in mathematics achievement'
(TIMSS 2011:7)

Singapore average percentage 73% England 48% (content and cognition)

Pisa (Programme for International Student Assessment)

65 Countries: Children aged 14

2012 mean score: Shanghai 1st England 26th

So we are trying to find out whether ...



... pedagogical approaches developed in Shanghai and Singapore can inform our own teaching and learning in primary mathematics and beyond?

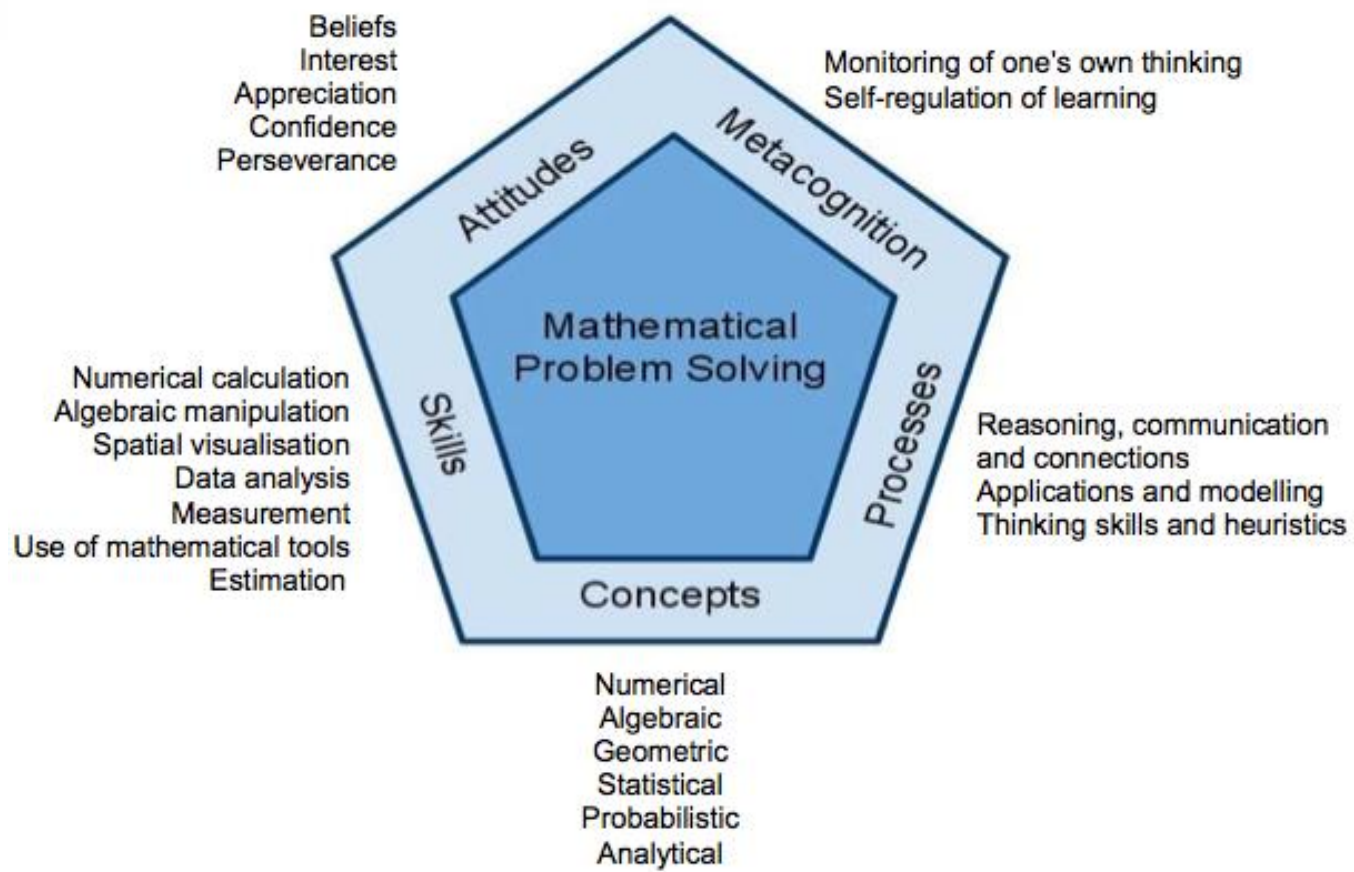
Singapore/Shanghai approach to mathematics



2015 Government Focus: Large Exchange Programme involving 60 teachers from Shanghai

Mathematics Curriculum Framework

Singapore



(CPDD, 2013)

Attitudes to mathematics

A decorative graphic in the top right corner featuring several colorful blocks. One block is yellow with the number '6', another is pink with a plus sign '+', and a third is teal with the number '1'. Other blocks with numbers like '5' and '10' are visible in the background.

Discuss in groups:

- What is the stereotypical attitude towards this subject?
- Why do you think this has come about?

Research indicates 3 key factors

A British Problem?



Mathematical skills are **not** in decline worldwide.

Attitudes towards mathematics differ hugely
between countries

A British Culture Issue?

Royal Society report (Primary Science and Mathematics: Getting the Basics Right) 2010

*“children’s initial experiences of education can have profound implications for their future success and well-being. Children are innately curious about the natural world. But, year after year, large proportions are ‘turned off’ science and mathematics **by the time they reach secondary school.**”*

‘our children are not stupid; our children are not inherently inadequate; our children are not born hating maths, we just manage to convince them that they should!’

Carol Vorderman Guardian 17th June 2008

Research into primary mathematics shows that:

'teachers who dislike maths will find it difficult to be enthusiastic about teaching it.'

'teacher anxiety ... can often be passed on to the children they teach', thus perpetuating the cycle of negativity'

'teachers own negative attitudes to mathematics can have a significant influence upon children'

Donaldson, G. Field, J. Harris, D. Taylor, H. and Tope, C. (2012) *Becoming a Primary Mathematics Specialist Teacher*. London: Routledge

VERY DIFFERENT ATTITUDES IN SHANGHAI AND SINGAPORE



As a NTF I have been allowed time to develop and lead two external research and enterprise projects – looking at lessons we can learn in two particular areas:

Two large nationally funded projects:

Whole School Approaches to Teaching Times Tables (19 schools)

Whole School Approaches to Consistent Modelling (Bar Model) (21 schools)

Consistency and Progression in modelling and representation

KS2 2012

24

In a class, 18 of the children are girls.

A quarter of the children in the class are boys.

Altogether, how many children are there in the class?



Show
your
working

Singapore Approach (consistent across all schools)



Visualisation



12

6

3

$$57 + 23 = \square$$

CPA approach

Bruner's theory[†]: knowledge representation develops in 3 stages

- i. **Enactive** - based on hands-on sensory experiences of physical objects together with the consequences that go after.
- ii. **Iconic** - Knowledge can now be represented using models and pictures. Learners know how to make mental images of their world.
- iii. **Symbolic** - Learners can think in abstract. So abstract terms and symbol systems can be used to represent knowledge like numbers, mathematical symbols, letters and language.

Have a go



Helen has 9 times as many football cards as Sam.

Together they have 150 cards.

How many more cards does Helen have than Sam?

Have a go



- A herbal skin remedy uses honey and yoghurt in the ratio 3 : 4.
- How much honey is needed to mix with 120 g of yoghurt?

Fractions in year 2 (age 5/6)

A decorative image in the top right corner featuring several colorful blocks. One block is yellow with the number '5', another is pink with a plus sign '+', and a third is teal with the number '1'. In the background, there are more blocks with numbers like '6' and '10'.

NC 'Add and subtract fractions with the same denominator with one whole'

Using the bar

Video clip – then have a go

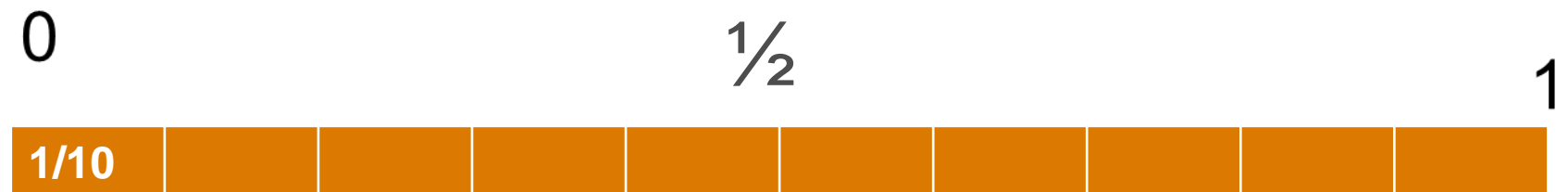
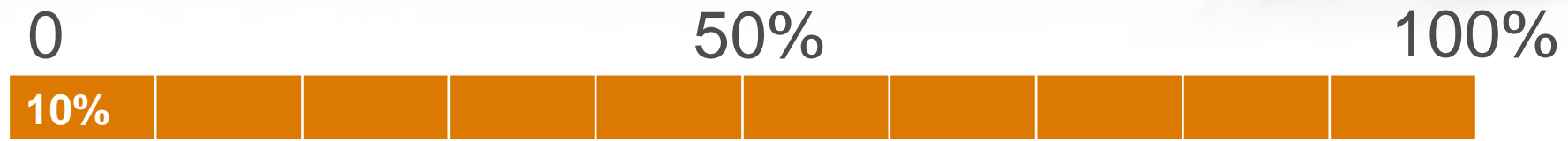
Reasoning about fractions (KS1)

<https://www.ncetm.org.uk/resources/43609>

Take a Strip and a paperclip



What do our students struggle with?





In many ways it is this consistency and progression in modelling that appears to makes the difference

小丁丁站在木凳上后，就和爸爸一样高了。
小丁丁的身高+木凳的高度=爸爸的身高。

如果小丁丁的身高为 y cm，
那么 $y + 25 = 173$ 。

例 3

x	7
12	

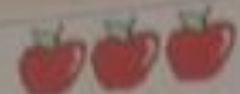
y	y	y
12		

两排积木一样长。
上排积木的长度 = 下排积木的长度。
所以： $x + 7 = 12$ ，
 $3y = 12$ 。

像 $3 \times 2 = 6$ ， $5 + 17 = 18 + 4$ ， $2x = 250$ ， $y + 25 = 173$ ， $x + 7 = 12$ ， $3y = 12$ 等表示两边相等关系的式子都叫做等式。
特别地，我们为了求未知数，把像 $2x = 250$ ， $y + 25 = 173$ ， $x + 7 = 12$ ， $3y = 12$ 这样含有未知数的等式叫做方程。方程的作用是能够表示一种等量关系。

把小胖的苹果数增加2倍

小胖原有的苹果:



增加2倍后的苹果:



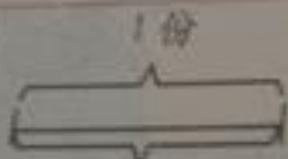
把“3个苹果”看作1份，增加2倍就是增加这样的2份，也就是增加2个3。



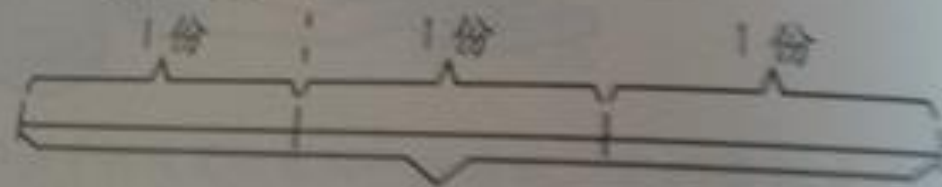
答: 把小胖的苹果数增加2倍是 个苹果。

把小胖的苹果数增加到5倍是几个苹果?

原有的苹果:



增加后的苹果:



? 个苹果

把小胖的苹果数增加到5倍是

个苹果

海
来

我
之



2005年

2007年



SO where next ...



Step one:

Action Research – results published and presented for both projects

Step two:

Next year a Case Study of several schools as they take this forward (more longitudinal study)

Step three:

Repeat both projects with 40 new schools 😊



Being a NTF has:

- Raised my profile
- Increased my value to my university
- Given me more freedom to nurture my research and enterprise work
- Allowed me to extend my role to become even more outwards facing and spend more time pursuing the things I love

... thanks for listening 😊