Primary & Early Years Magazine 104

National Centre for Excellence in the Teaching of Mathematics

Welcome to the first edition of the NCETM's Primary Magazine of the new year, and a special welcome to all those NQTs and trainee teachers picking up their first classes. The Primary Magazine aims to feature excellence in mathematics teaching in all its forms, as well as keeping you updated with NCETM's work and the work of the national network of locally-based Maths Hubs – which is the first place to look for excellent professional development opportunities. Look out for the magazine in your inbox every half term.

In this edition we take a look at 'subitising', a skill that is presently getting a lot of attention in Early Years, but relevant to teachers of all ages. And we are also sharing the delight of some of the schools seeing results-based success that they are attributing to a teaching for mastery approach to mathematics. As a third, new, feature, we will be signposting an article from our Secondary Magazine, that may be of relevance or interest to primary teachers. Don't forget all previous issues are available in the Archive.

This issue's featured articles

Subitising: developing a sense for number in Early Years
We talk to Viv Lloyd, NCETM's Assistant Director for Early Years, about what 'subitising' is, why it is important, and why it is making an appearance in the new pilot Early Learning Goals.

Emerging evidence beginning to show that teaching for mastery is raising attainment
Although teaching for mastery is not yet sufficiently widespread in Y6 classes to have shown an effect in national SATs data this year, individual schools that have been using the approach for a few years are starting to share very encouraging results stories.

Setting for maths in secondary schools: can it work with mastery?
More and more primary schools are rethinking the practice of grouping children (in tables or classes) by their prior attainment. But how can teaching for mastery work in secondary schools where 'setting' is more entrenched? One of our Secondary Mastery Specialists explains how it works at her school.

And here are some other things for your attention:

- The Education Endowment Foundation (EEF) has recently reported on trials of two maths interventions to raise attainment: Maths Champions, a programme where senior staff in Early Years are trained to build the confidence and skills of the practitioners working with children, and 1stClass@Number, a programme providing intensive support for Year 2 pupils, delivered by teaching assistants.
- Have you thought about professional development for you or your school this year? The Maths Hubs website gives an overview of national CPD projects, and your local Maths Hub will be able to tell you what's available locally. Register NOW, as most start this term.
- There are loads of good maths storybooks and ideas for teaching on the MathsThroughStories website. They even have a new competition for young writers (age 8-13), The Young Mathematical Story Author Competition.
- Our popular mastery professional development resources for primary teachers have now been enhanced for number, addition and subtraction, so that there's now something for every year group.

- Over the summer, we continued to expand our support materials for the CBeebies series, *Numberblocks*. We've now also added two documents giving an overview of each series, the storylines, and the mathematics addressed.

Image credit: page header by Jonah Pettrich (adapted), in the public domain

Subitising: developing a sense for number in Early Years

Subitising: a skill we all use but are unlikely to remember learning. Now 'subitising to 5' is explicitly specified in the pilot Early Learning Goals (ELG) for Mathematics.

So, what is subitising? Why is it important? And how do practitioners provide opportunities to develop this skill in young children?

The pilot Framework for Early Years Foundation Stage has been published and is due to be piloted by 25 schools in 2018/19. Within this framework sit the proposed *Early Learning Goals* (p12/13), including those for mathematics. There are two goals for mathematics: Number, and Numerical Patterns. Within Number, the second of three bullet points is:

- **Subitise (recognise quantities without counting) up to 5;**

What is Subitising?

Sarama and Clements (2009)[1] defined subitising as

> "A quick attention toward numerosity when viewing a small set of objects".

It is the ability to quickly recognising how many objects are in a group without actually counting them. As adults, most people can subitise up to five objects – this is called **perceptual subitising**. We also subitise larger numbers of objects by 'seeing' them in groups of five or less and combining these – this is called **conceptual subitising**. How would you 'see' how many parakeets are sitting on this building?

(photo: Dr Ruth Trundley)

The ability to subitise develops instinctively. The development of this skill in young children is fascinating: from the two-year old who can distinguish between one and two objects, to the three-year old who can build a group of objects of the same number as the group s/he has seen briefly, to the four-year old who starts to recognise and use number names for groups up to four.

Perceptual subitising to five, doesn't usually occur until a child is five years old, and conceptual subitising develops gradually from there on.

Why is it important?

Our ability to perceive the exact quantity of small groups of numbers, and to put these numbers together to perceive the quantity of larger groups, is fundamental to our understanding of how numbers partition. For example:

How many dots are here?

…you have probably recognised 4 and 3 and know that they add to make 7, most likely without any counting or calculation. If this is the case, you have subitised. This is an important part of developing number sense. Subitising this group of 7 is far more efficient than either using a touch-counting method, or perceiving 4, then counting on.

NCETM Assistant Director for Early Years and Primary, Viv Lloyd, says,

> "Subitising is so critical because you are starting to see the numbers within numbers, so once you start subitising to 6, you are starting to see 5 and 1, 4 and 2, or 3 and 3, and that is building a sense of the 6-ness of six as well as being introduced to the number bonds. Children can playfully experience this and draw on that knowledge in later years to recall those facts. Separation and recombining is a more effective calculation strategy than 'counting on' or 'counting back'. So counting on and counting back is not in the pilot Early Learning Goals (whereas it was previously in the old ones), and subitising is now explicitly specified."

Don't children just pick this up?

Yes, children do just pick this up. As Viv says:

> "There's absolutely an intuitive nature to subitising. If a child is not picking it up, providing opportunities to subitise at a developmentally appropriate level may help, or there may be another reason that needs more exploring."

The role of the Early Years practitioner therefore is less in explicitly 'teaching' subitising, and more in providing opportunities to develop the skill, and also to exploit it to help develop number sense. So whereas children might, most naturally, develop the ability to recognise:

…as five, because of the familiarity with this pattern on dice, the EYFS practitioner might provide opportunities for children to see numbers up to five in many other less organised arrangements, and to talk to children about the groups of smaller numbers they 'see' within the bigger numbers. For example, a child might be encouraged to throw four two-sided beanbags

…and to say how many landed red-side up, how many blue-side up and how many this makes altogether, developing familiarity with number bonds. Addition is implicit in this play before it becomes an explicit learning intention in KS1. Viv explains:

> "There is an intuitive nature to subitising, but we are potentially limiting that intuitiveness if we do not give the full range of experiences. So if we only ever present five as the numeral 5, or the dice pattern of 5, children don't spot 5 at other times. We can use their knowledge of 5 when playing skittles by setting 5 pins, throwing the ball and highlighting how many are knocked down or remain standing, and encouraging them to notice what that looks like, or maybe to draw it. We repeat lots of times so children are developing lots of ways of seeing that 5."

How these ideas are built upon in Year 1 can clearly be seen in the Number, Addition and Subtraction spine of the NCETM PD materials.

How much should we be doing in Foundation Stage?

Children should be subitising only to five, in Foundation Stage, both perceptually, and by beginning to look at numbers within five. Some children only reach the age of five at the end of their Reception year, and therefore would not be expected to recognise five objects from early on, but may build up to this by the end of the year.

Viv recognises that this new emphasis in the pilot ELGs, is a move away from a traditional emphasis on learning to count using touch-counting.

> "If a child can see it's 3, and consistently knows it's 3, that's a really good skill, and they don't need to touch count those 3".

Should we be using the word 'subitise' with the children?

Viv says, "I would probably say 'let's subitise this'. Part of a mastery approach is being clear about what we want them to pay attention to, so if we've got a word for that, I would use it, but I understand that some practitioners would not."

What activities could we do to encourage children to subitise?

- Games that involve hiding a small number of objects in a box or under a cloth, and getting children to take a peek and say how many there are.
- Throwing a number (up to 5) of two-sided beanbags. Children then say what they can see "I can see 2 patterned and 1 plain beanbag – there are 3 beanbags altogether". A more complex version of this would be to hide some of a known number of beanbags. "I have 3 beanbags. I can see 2, so there must be 1 in the box."
- Using 5 seeds, plant them in 2 flowerpots, talking about how many seeds are planted in each pot and making a total, for example, "2 seeds are planted in my pot and 3 seeds are planted in your pot. There are 5 seeds altogether".

Other activities are suggested in Number Sense Series: Developing Early Number Sense from NRICH, by Jenni Way.

Or you might like to see how the CBeebies *Numberblocks* series introduces subitising, and use our Numberblocks Support Materials with your class (Series 1, Episode 11 addresses subitising to 5).

[1]Sarama, J. and Clements, D.H., 2009. *Early childhood mathematics education research: Learning trajectories for young children*. Routledge.

The new pilot EYFS framework is being piloted in 25 schools this year and will later be opened up for public consultation. If you would like to respond to the consultation, look out for notification when it opens, in this magazine.

Schools on Teaching for Mastery Programme report rising attainment

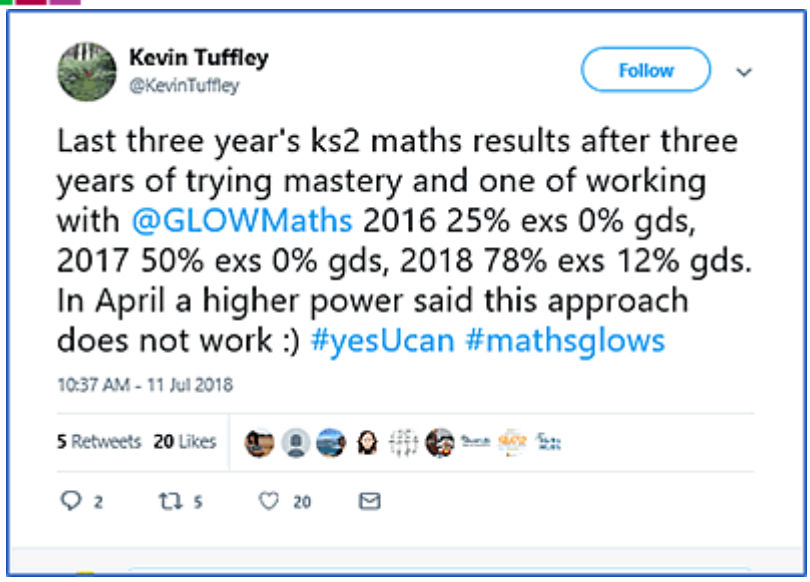
Three years into the Maths Hubs/NCETM Teaching for Mastery Programme in primary schools, and many schools are communicating positive impact on results.

Teachers are telling us that their pupils are more engaged with maths: it's a huge boost for schools when this is matched with improved SATs results. Some turn to Twitter to share their success and we have been picking up some of these stories over the summer.

More than 500 schools now have a Mastery Specialist, trained as part of an NCETM/Maths Hubs programme. Among them is William Morris Primary School, Banbury, which works with GLOW Maths Hub. This tweet emerged highlighting the school's SATS results:

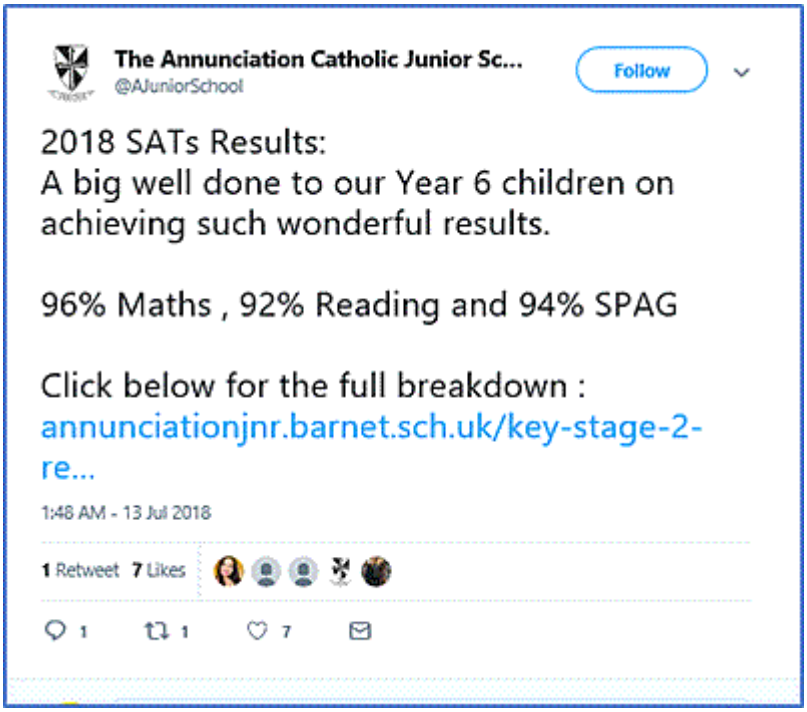
Teachers involved in the Mastery Specialist Programme have been telling us from the outset how excited they are by the impact in their classrooms: improvements in children's confidence and enjoyment, and evolving depth in their understanding.

However, schools have had to be a little more tentative in trumpeting improvements in KS2 results based on a single year's data. Now some schools are able to look at two or three consecutive years of data and are finding results encouraging. Drybrook Primary School, Gloucestershire (GLOW Maths Hub) was another…this was their message in July:



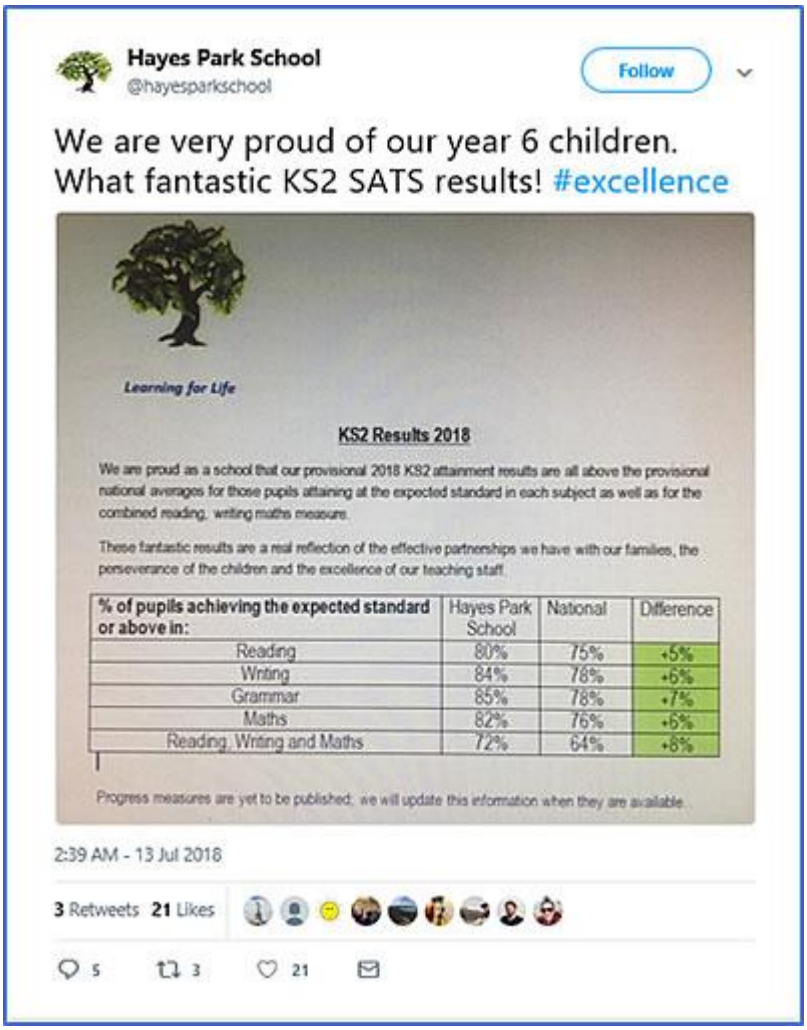
Well over two thousand schools have now been part of year-long Teaching for Mastery Work Groups, led by Mastery Specialists. These three told of their SATs success on Twitter:

Annunciation RC Junior School, in Barnet (London Central and NW Maths Hub) – their Maths results in 2018 were 96% Age Related Expectations, up from 81% in 2017:



Margaretting C of E Primary School, Essex (Matrix Essex and Herts Maths Hub):

Hayes Park School, Hayes, Middlesex (Bucks, Berks and Oxon Maths Hub):



Other schools have been involved in some of the many other professional development Work Groups run by hubs around a teaching for mastery theme. For example, Oakfield Primary School in Hull were involved in the first project to trial textbooks to support teaching for mastery and have since been involved in other Yorkshire and the Humber Maths Hub projects. They emailed the hub, who then tweeted their good news:

We are often asked about evidence of the impact of teaching for mastery at national level, and this is something that is being collected and carefully monitored at the NCETM. However, because schools have been encouraged to decide for themselves how and when to introduce a teaching for mastery approach, this has happened differently in different schools. Some schools made the decision to introduce teaching for mastery across all year groups whilst others decided on a more staggered approach. This has meant that the obvious data to collect – comparative KS2 results – may not, in some schools, reflect a year group that has been learning with a teaching for mastery approach. In the meantime, we are hugely encouraged by the individual success stories that many schools are sharing publicly.

Interested in knowing more about the NCETM/Maths Hubs Teaching for Mastery Programme? Your local hub may still have places available for schools to work with local Mastery Specialists this year or next. There is also a wealth of information and resources in our mastery section.