NEWSLETTER

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NCETM - Updates

After what has been a challenging start to the term, we want to wish all of our Maths Hub community a very happy new year. Undoubtedly, this is not the start to the term that we had anticipated, but once again the teaching profession has indeed shone, showing how quickly they can adapt and change and put students learning at the centre of what they do.

Encouraging, supporting and collaborating lie at the heart of everything that we do at the Great North Maths Hub. Despite the turbulent climate we are working in, we have been heartened to see so many of you committed to your own professional development. We have met many of you over the past few weeks as our Work Groups have begun. It has been lovely to welcome new and familiar faces to our sessions such as Subject Knowledge for Teaching Assistants, Working Memory and Year 5 to Year 8 Continuity and meeting you all online. You've kept smiling and have been committed to developing professionally throughout. It has been a real pleasure and it has also reminded us of what puts the 'Great' into the Great North Maths Hub.

This month, we explore subject knowledge in teaching fractions in the primary curriculum as well as exploring what remote learning can look like in Early Years. Our NCETM updates have details of materials to support learning at home and in the classroom.

Training Suite

"To teach for understanding, you have to understand what you teach."
Early Math Collaborative (2014)

Teacher Development Matters

In the McKinsey Report (2007), Barber & Mourshed explored the differences between school systems around the world to find out why some education systems consistently performed better and improved faster than others. Their findings were summarised as:

1. **"The quality of an education system cannot exceed the quality of its teachers."**
2. **"The only way to improve outcomes is to improve instruction."**
3. **"High performance requires every child to succeed."**

Similarly, and more recently, the EEF Guide to Supporting School Planning: A Tiered Approach to 2020-21 prioritises high quality teaching for all as the most important lever schools have and adds that any whole-school planning which focuses on high quality teaching requires the support factor of sustained professional development.

With their 'Whole Teacher Approach', the Early Math Collaborative recommends a holistic approach to maths professional development which allows teachers to: deepen subject knowledge; discuss attitudes towards maths teaching; and develop classroom practice. These 3 aspects are at the heart of our Subject Knowledge for Teaching for Mastery (SKTM) programmes.

A Brief Introduction to Primary SKTM: Fractions

Our suite of fully-funded professional development opportunities includes subject knowledge for the teaching of mathematics (SKTM). This year SKTM programmes will incorporate discussions of the challenges faced by teachers in response to Covid-19 and the Primary programme will discuss the DfE Primary Maths Guidance to support subject knowledge development. The NCETM's supporting materials to use alongside the Guidance provide practitioners with tools to use in practice which emphasise specific language structures and build upon a core set of representations. Take the Fractions strand as an example. In the guidance, the wording of the Ready to Progress criteria places emphasis on ensuring children understand a fraction as an operator and as a number. This is a key idea which is implied within the statutory guidance of the year 3 National Curriculum and is explicitly stated in the Guidance highlighting its significance. Most year 3 learners develop familiarity with fractions as an operator when they find fractions of shapes or find fractions of amounts. In the Guidance, understanding fractions within 1 in the linear number system is explored in year 3 and the conceptual prerequisites and future applications allow us to track this key idea to see why it is relevant.

| Year 5 Conceptual prerequisite	Year 6 ready-to-progress criteria	Key stage 3 applications
Reason about the location of fractions and mixed numbers in the linear number system. Find Equivalent fractions.	6F–3 Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison strategy.	Order positive and negative integers, decimals, and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, <, >, ≤, ≥

Within the NCETM supporting PowerPoints, this idea is explored using the core representation of the number line. How often are children given fraction number lines to work with in year 3? We see repeated use of the number line across other areas of fractions in years 4, 5, and 6. This fits into the core set of representations for fractions allowing children to connect current learning with prior knowledge and to facilitate future links.
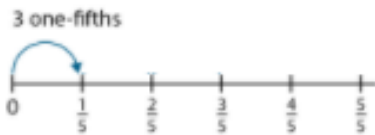
There are three one-fifths in three-fifths.

The supporting stem sentences ensure that important ideas being exposed by the representation are captured and communicated. The language structure used in the stem sentence highlighted here to aide understanding of counting in fractions reminds me of aspects of counting and cardinality explored in the Number Pathway of the SKTM programme for EYFS.

To support young children's understanding of one number for each item, objects might be named and moved as they count: "One car, two cars, three cars – there are 3 cars." This then supports them to know that the last number in the count tells us how many there are. In year 1, we find this language structure within the place value unit where children count in two ways thereby giving meaning to our counting system:

Seven, eight, nine, ten, eleven, twelve… twenty, twenty-one, twenty-two…
Seven, eight, nine, ten, one-ten, one-ten-one, one-ten-two… two-tens, two-tens-one, two-tens-two…

And then into our work on year 3 fractions, the children are counting as:

one one fifth, two one fifths, three one fifths…

We can see how careful and precise use of language supports learners to develop conceptual awareness of our number system and allows children to connect mathematical ideas within counting. These language structures will also enable children to apply this knowledge when working on composition.

References

Barber, M. & Mourshed, M. (2007) *How the World's Best Performing School Systems Come Out On Top* McKinsey & Co.

Early Math Collaborative – Erikson Institute. (2014) *Big Ideas of Early Mathematics: What teachers of young children need to know.* New York: Pearson

EEF. (2020) *The EEF Guide to Supporting School Planning: A Tiered Approach to 2020-2021.*

The NCETM Exemplification Materials to use alongside the DfE Primary Guidance can be found here:
https://www.ncetm.org.uk/classroom-resources/exemplification-of-ready-to-progress-criteria/

Considering the Role of Open Approaches in Remote Learning for Young Learners

Lindsey Hassan

'One test of the correctness of educational procedure is the happiness of the child.'
Maria Montesorri

Think about your most inspirational lessons as a learner. My favourite memories of maths learning involve interesting problems, creative freedom and playful investigation. I remember how the best lessons made me feel. In the middle of this third national lockdown, mental health is a priority for us all. In this article we consider strategies to support mathematical well-being during remote learning.

In thinking about mathematical well-being, Williams (2020) describes what matters most as:

> Building young children's confidence, their willingness to have a go, their mathematical self-esteem and enjoyment; and establishing firm relationships with the adults in school and with their families.

Day (2014) finds that questioning and enquiring lead to pleasure and purpose for mathematical learning, and Stigler and Hiebert (1999) noted in their international comparisons that students who are taught through 'open' problems show higher levels of engagement and involvement in learning. Is it possible to develop children's mathematical wellbeing through the use of open questions in a remote learning environment? Russo et al. (2021) found that one reason teachers avoid this approach is to avoid anxiety-inducing experiences for parents in their role as remote learning facilitators. Research from National Numeracy (2020) finds maths anxiety, negative attitudes and fixed mindsets as the root cause of the UK numeracy crisis. If parents' and carers' own experiences of maths have been less than positive, how can we provide learning opportunities which allow both the child and the supporting adult to engage positively?

Sharing Mindset Messages

Many teachers are sharing maths stories online as a hook to engage the children in their learning. (Mathsthroughstories.org is an amazing resource for this.) These examples have messages around the importance of struggle and the power of learning from mistakes:

To support their work for mental health week, one of our Great North local primaries is using positive mindset stories alongside the NRich Habits of Mind materials so families receive positive mindset messages before working together on problem solving activities. These problems have been chosen for their suitability to remote learning: NRich at Home: https://nrich.maths.org/maths-at-home

Meaningful Experiences at Home

Open problems are those which have more than one solution or more than one approach or lead to other lines of inquiry (Becker & Epstein, 2005). These are more likely to be accessible to families when they are linked to the home environment. Examples could be:

- Write a list of the chores in your house today. Can you find a way to divide them up fairly between the family members?
- What is the difference in age between you and one member of your family? Which of your relatives have the smallest age difference and who has the largest?

- **If the position of a letter in the alphabet represents its value in pence, use our names to investigate who is the most expensive member of our family**

Further examples particularly suited to EYFS and KS1 can be found in the Ideas at Work series from the Early Math Collaborative here: https://earlymath.erikson.edu/series/ideas-at-work/

Thinking Skills of Familiar Concepts

Familiar inquiries can be a useful strategy for reducing anxiety and reconnecting students with a learning culture that requires deep thinking (Sullivan, 2020). There is real value in revisiting rich tasks that the children may have already looked at in the classroom, or, providing tasks which focus on thinking skills rather than new content. This task, for example, was used with my 7 and 9 year old children:

Can you rearrange the numbers on the clock so that the sum of 2 adjacent numbers is always even?

The required knowledge of addition and odd and even numbers were not new concepts to my children who are in year 2 and year 4 but the higher order thinking challenged them.

'Open question' approaches may be more difficult to organise in the remote learning environment and ideally we want a balance between behaviourist and constructivist approaches (Sullivan, 2020). But if mathematics learning is about closed questions, right or wrong answers and repetitive practice of specific procedures, we are denying learners the right to experience the creativity of the subject and we are preventing the development of positive mathematical mindsets which

are an aspect of mathematical well-being (Boaler, 2016).

Above all, we are all focused on the health and happiness of our learners. What messages do our maths remote learning tasks give to families? How will the maths make the child feel?

References

Becker, J. & Epstein, J. (2005). *Reflections on U.S. Collaborative Research in Mathematics Education*. In: C. Lewis & A. Takahashi (eds). *U.S. – Japan Collaboration in Mathematics, Science and Technology Education*. USA: National Science Foundation. pp.130 – 145.

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Russo, J., Bobis, J., Downton, A., Livy, S. & Sullivan, P. (2021) Primary Teacher Attitudes towards Productive Struggle in Mathematics in Remote Learning versus Classroom-Based Settings Education Sciences 11(35), 1-13.

Sullivan, P., Bobis, J., Downton, A., Feng, M., Livy, S., Hughes, S., McCormick, M., Russo, J. (2020) Threats and Opportunities in Remote Learning of Mathematics: Implication for the Return to the Classroom. *Mathematics Education Research Journal* 32(1)

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Williams, H, J. (2020) *Support for Reception and Year 1.* (28.1.2021) Available here: http://www.codemathshub.org.uk/wp-content/uploads/2020/06/Early-Years-Return-to-School-guidance.pdf

NCETM Updates

A reminder that NCETM have a wide range of materials and guidance to help primary and secondary schools adapt maths teaching for pupils learning both in the classroom and at home.

The primary materials can be found here:

https://www.ncetm.org.uk/in-the-classroom/teaching-maths-through-the-pandemic/primary-video-lessons/Videos

Resources for Key Stage 3 maths topics can be found here:

https://www.ncetm.org.uk/classroom-resources/planning-to-teach-secondary-maths/

AMSP have published a series of videos designed to support teachers who have moved some, or all, of their teaching online.

These can be found here:

https://amsp.org.uk/resource/teaching-online

#EncourageSupportCollaborate

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