Primary
& Early Years
Magazine 89

National Centre
for Excellence in the
Teaching of Mathematics

Welcome to another issue of our Primary Magazine, which has now been serving primary teachers for 89 issues with a varied collection of articles related to maths education and mathematics professional development - all of which are available in the Primary Magazine Archive.

Contents

In Digging Deeper each month we will explore an element of mathematics teaching linked to current developments and research: in this issue we look at ideas around journal writing in mathematics, and hear from a school where they've moved to exercise books with blank (not squared) pages to help children think, write and draw about their own learning.

Aspects of… provides a number of bitesize ideas related to a specific element of mathematics; this month: aspects of place value in the context of decimal numbers.

Seen and Heard provides a specific example of a child's response to mathematics in a classroom to stimulate thinking and provoke questions about how you would react to similar events in your own classroom. In this issue we consider understanding of the relationship between numbers.

If you have a photograph, or an account of a classroom conversation, that might stimulate similar thought, please email it to us. If we publish your suggestion, we'll put a £20 voucher in the post.

Next month we will have articles focused on what can be learnt from the end of KS1 and KS2 tests papers and preparing for Y6. But first, as always, we have a News section, bringing news from the NCETM and beyond to keep you up to date with the fast-changing world of mathematics education.

News

Every Tuesday from 7-8pm the NCETM hosts a Twitter-based chat, designed to engage teachers of all age-groups as well as maths educational professionals, using the hashtag **#mathscpdchat**. Each chat is centred on a specific theme and the chats are all available to view afterwards through the archive. Recent chats have included Manipulatives: which do you use? How do you use them? Which pupils benefit most? How and Why?, Gauging deep mathematical understanding at KS2: new demand or fad?, and Reasoning: what do your pupils find hard/easy to reason about? Tasks and strategies to help them?. Suggestions for discussion themes are welcomed and can be emailed to info@ncetm.org.uk - or tweet @mathscpdchat.

Should we encourage children to use their fingers to count? New research, apparently, suggests we should. And it was included (eight minutes in) in this recent TEDx talk by Jo Boaler at Stanford University, USA. Jo Boaler and colleagues at Stanford have also created a fun, visual task that combines mathematics and art for use as we near the end of the school year.

The Standards and Testing Agency has updated the information for parents about the KS1 and KS2 tests. This might prove useful as you consider how you are reporting end of key stage results to parents.

And just as the NCETM Primary Magazine was going to press, the DfE released this information to help teachers understanding the 'scaled scores' system being used for the first time in this year's KS2 SATs results.

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Digging Deeper

Journal writing in mathematics

In the supplementary subject-specific guidance for mathematics produced by Ofsted (2012), it provides a description of outstanding learning in mathematics which includes a statement that pupils *"think for themselves, and are prepared to persevere when faced with challenges, showing a confidence that they will succeed. They embrace the value of learning from mistakes and false starts."*

This idea that mathematics teaching should aim for pupils to 'think for themselves', along with the expectation that they communicate their thinking and reflect on their learning, is evident in the expectations of the Primary National Curriculum:

> *"pupils… must be assisted in making their thinking clear to themselves as well as others…"* (page 100)

The reason for this is that thinking is at the heart of mathematics, and communication of thinking deepens understanding and allows for effective assessment. One of the big challenges for teachers is how to create and maintain a focus on thinking within and throughout mathematics lessons. Journal writing in mathematics is one way to do this, providing an opportunity to step back from 'doing' the mathematics; it is about encouraging children to notice things about how the mathematics works and reflect on their own understanding of the mathematics.

Purposeful writing can be prompted and supported by purposeful talk, which helps to shape writing. In the paper Private Talk, Public Conversation, Mike Askew suggests that:

> *"The skill of the teaching of talking mathematics is giving children something mathematically worthwhile to talk about, accepting what children say, and then supporting them in crafting the talk".* (page 5)

Supporting talk and writing in mathematics involves both providing mathematical experiences which are worth talking and writing about **and** modelling and scaffolding the talk and writing. Providing prompts, which indicate to the children that they should attend to their mathematical thinking, is one way to support the talk and writing:

… sentence starters were modelled and then used by the children. These included 'I agree…' and 'I disagree…' to focus the children on what other children were saying and to reflect on their own thinking, providing reasons for this thinking. Other sentence starters were used to support children in explaining their thinking and to support writing following talk. These starters included:

- *I know that*
- *I notice that*
- *I think that*
- *I wonder* if

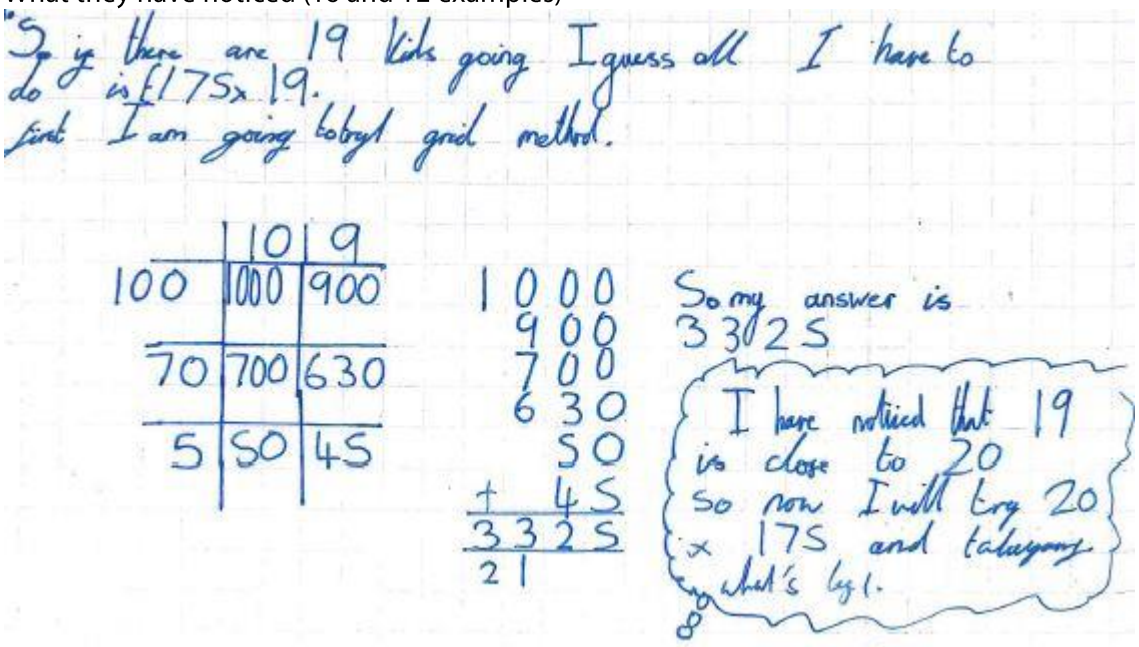
(Teaching for mastery in mathematics in mixed-age classes: Final report 2016 – see Primary Magazine Issue 86 for further information about this research project and report)

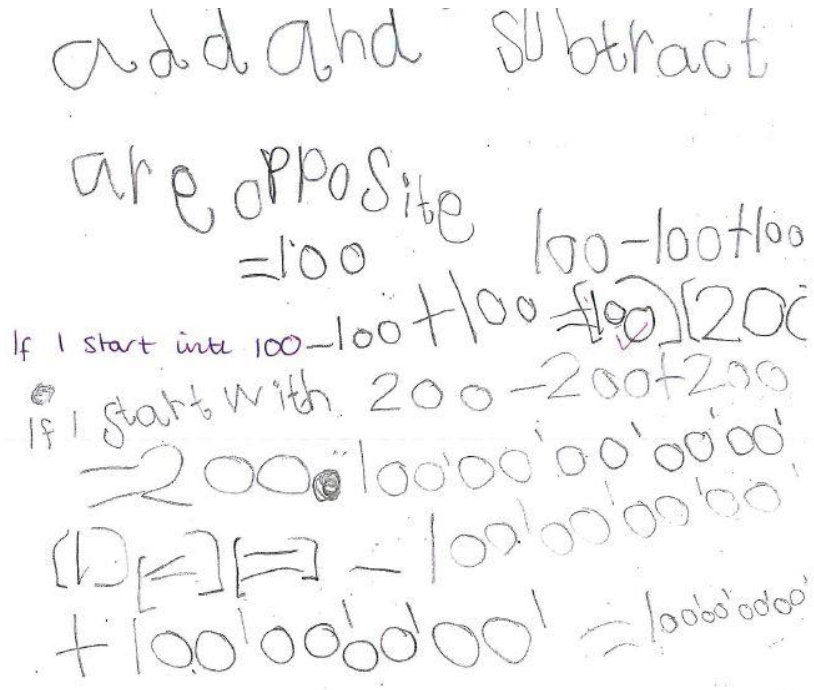
Reflective 'journal' writing might happen at different times, in different places and for different reasons. The constant is the focus on thinking. Reflections might happen whilst working on some mathematics or

thinking about it afterwards: they might be written alongside work in maths books or recorded in separate journals. Thanks to teachers in the following schools for the examples included below: SS Peter and Paul Catholic Primary School, Brampford Speke C of E Primary School, Northam St Margaret's C of E (VA) Junior School, Ilfracombe Infant and Nursery School, Beaford Community Primary and Nursery School.

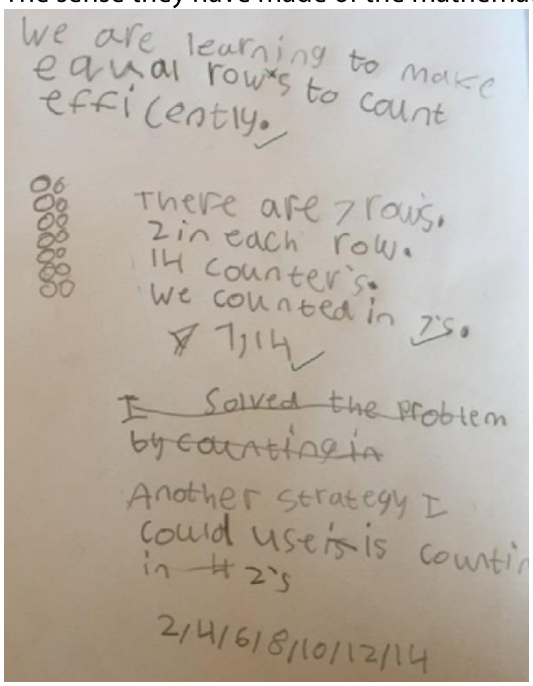
Children might reflect on:

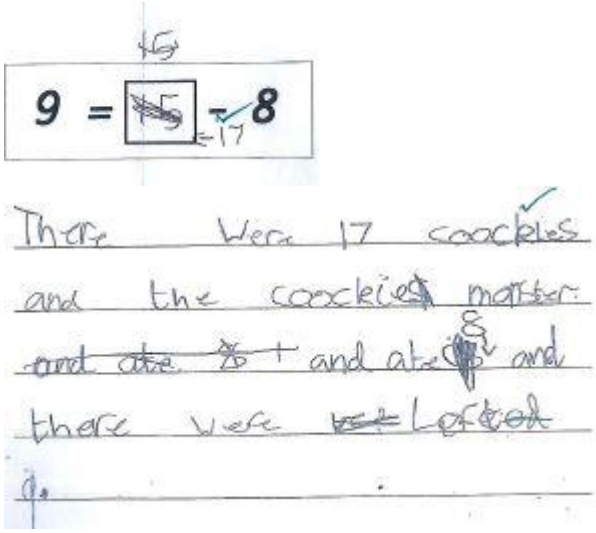
- What they have noticed (Y6 and Y2 examples)



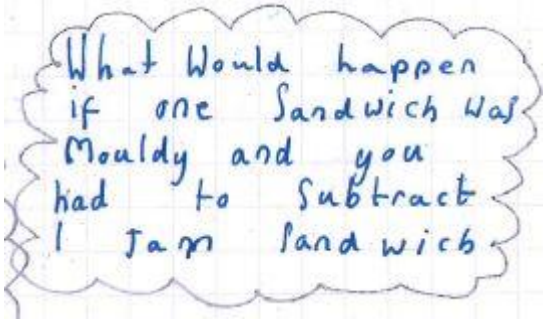


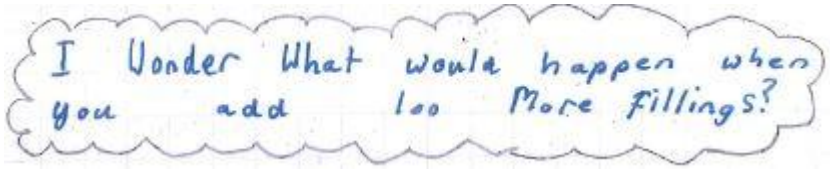
- The sense they have made of the mathematics (Y1 and Y2 examples)

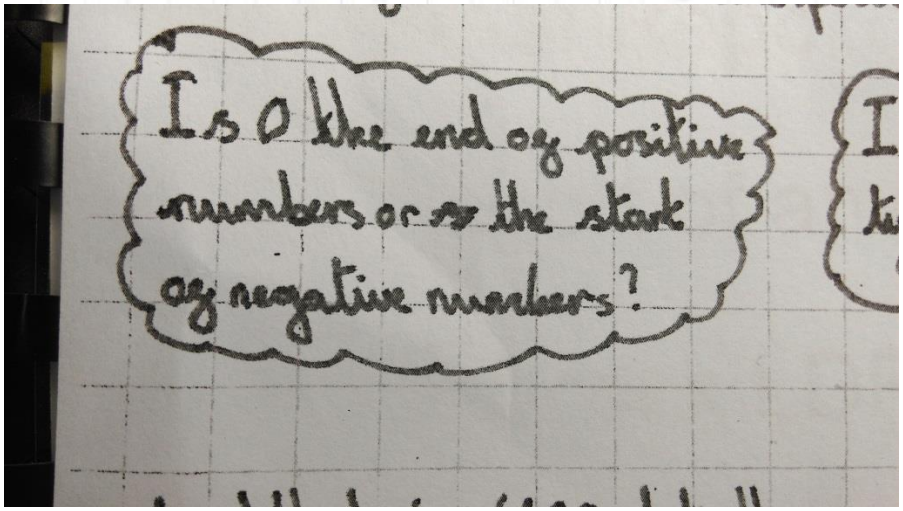


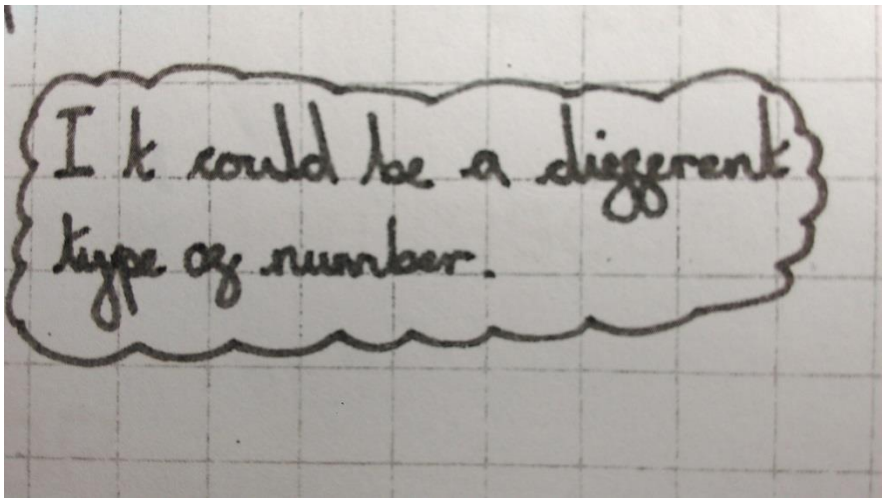


- Questions prompted by the mathematics (Y4 and Y6 examples)

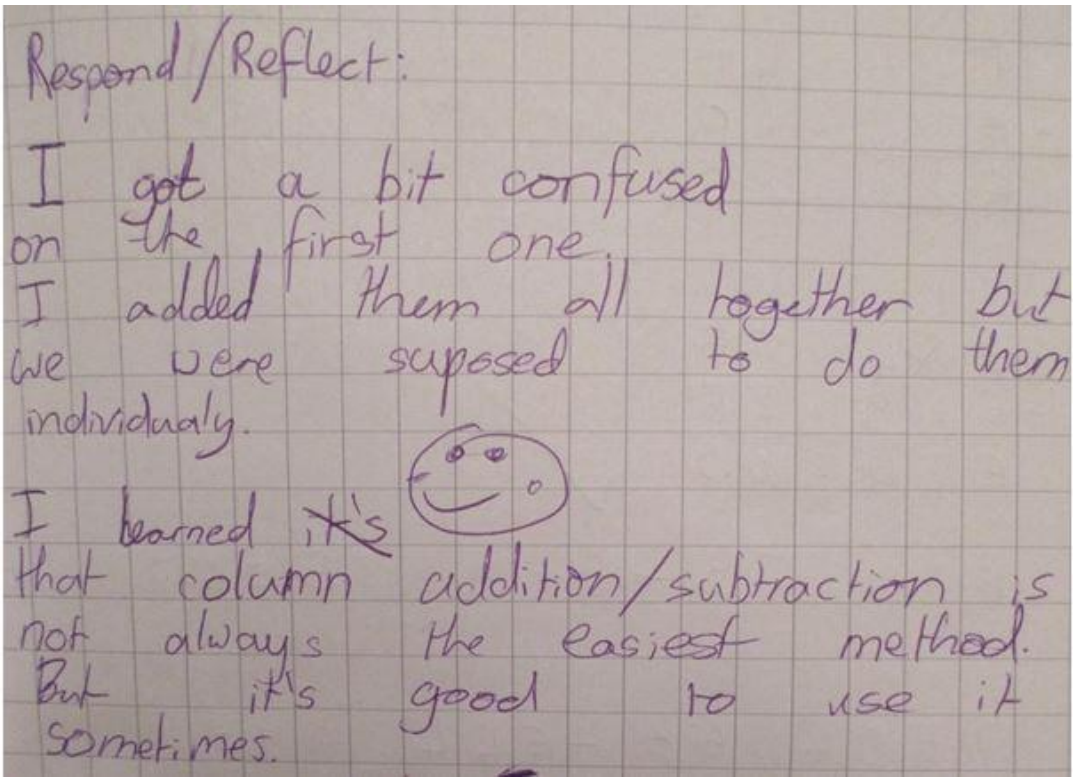



I Wonder What would happen when you add loo More fillings?

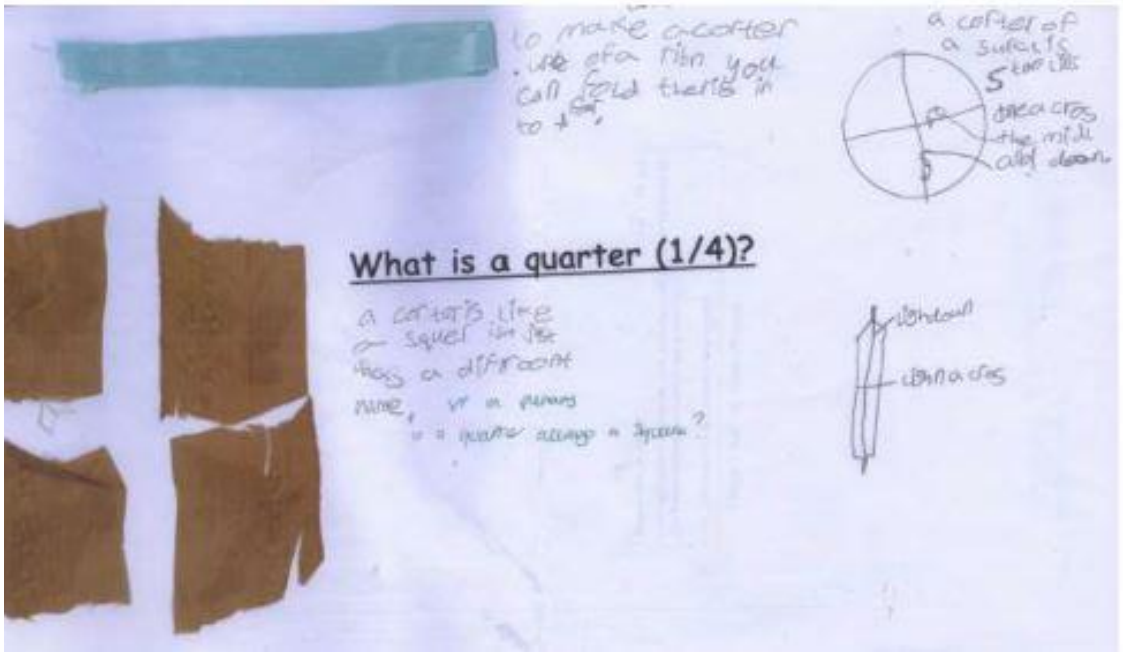

Is 0 the end of positive numbers or the start of negative numbers?

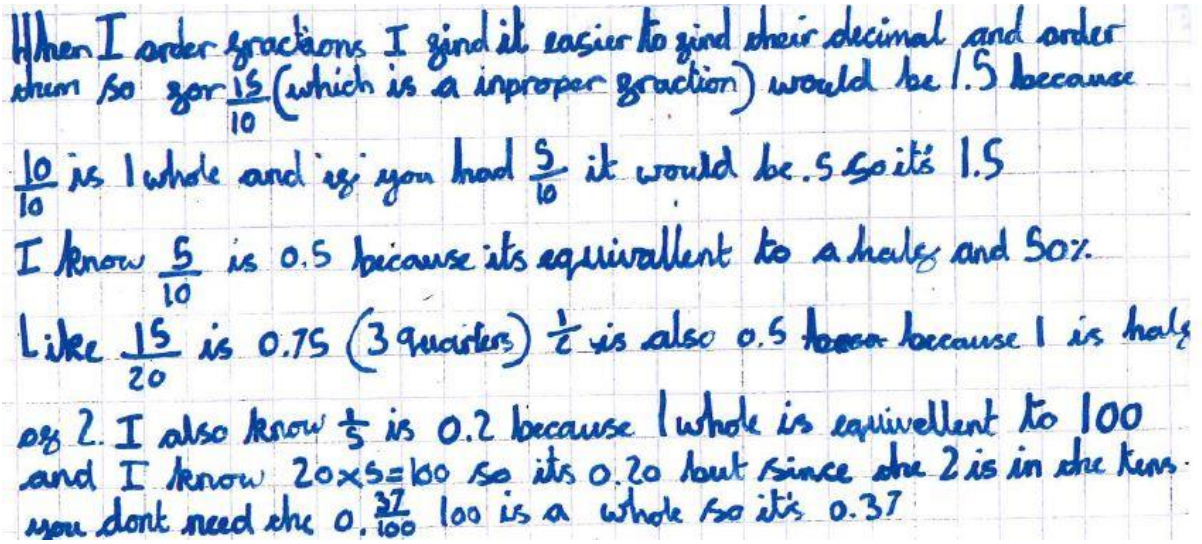

I k could be a diggerent kype of number.

- What they understand after completing some work (Y4 example)



- How they can demonstrate their understanding (Y2 and Y5 examples)





Serena Grear, who has just completed her development year on the Maths Hubs Mastery Specialists programme, working with the London South West Maths Hub, has been exploring journal writing in her school, and has written about the impact in this short article:

Using Journals in Mathematics

Deciding to use journals was not the beginning of our mastery journey. In 2013 a poor set of results was the key driver in our consideration to reinvent how we taught maths at SS Peter and Paul, and through some valuable research, we introduced Bruner's CPA approaches. Many people may know this as "Singapore Maths"; we just followed the simple steps of concrete to pictorial and then abstract learning to help our children deepen their conceptual understanding. I was completing a master's degree in leadership and innovation, through the Mitcham Co-operative Trust and the University of West London, and decided to use the research I had undertaken (which focused upon talk in maths) as a way in to improve how the children at SS Peter and Paul engaged with their learning.

The first step was to withdraw from using squared paper and we gave the children books with completely blank pages. Some might think this was a bit radical; we believed that it gave the children the opportunity to begin to use their own representations and draw more, as our aim was for them to explore maths without fear. As this became embedded, we then started to give children speech bubbles to glue into their books, through which they could write their own reflections and reasoning. As this was new to the children, teachers would provide them with some maths sentence starters and key vocabulary to scaffold the children's reasoning. The children's reasoning skills developed immensely and they began to ooze with confidence when talking about their work; their skills and understanding had begun to improve.

Now each child, from Reception to Year Six, has their very own maths journal in which they jot, draw and write whilst talking about their understanding of the concepts within each lesson. The children are encouraged to show multiple ways, create their own maths stories and solve problems. The journals are not just a book to be filled with page upon page of calculations and word problems, but an engaging way for the children to interact with each other and their teachers during their learning journey. Journals have opened up a whole new world of learning at SS Peter and Paul and they provide a very clear picture of what our children have understood about the learning taking place in the classroom. Teachers can clearly see where a child has shown mastery and where they may require further challenge; for example, where a strategy or calculation is not explained with a "because," the teachers ensure that they ask "why" or "how"

questions to challenge and encourage their pupils to think deeper about their work.

We also use Singapore Maths workbooks from Maths No Problem at the school. These have been very powerful in supporting children's learning as they provide clear variation with each question further developing thinking and mastery; however the quality of work that the children do in their journals cannot be undervalued. Since beginning our journey, there has been a dramatic improvement in children's attainment and progress within mathematics and this continues to go from strength to strength as we seek more ways for our children to demonstrate learning through their journals. This was even more apparent in our most recent Ofsted inspection this May when it was reported that the school, "effectively encourage pupils to explain how" and that pupils, "make effective progress in their learning in mathematics." The children take great pride in their journal work and their response to our comments, questions and challenges - but what is even more uplifting is both their confidence in maths and, essentially, their love of learning.

Next time in Digging Deeper we will explore what can be learnt from the recent end of Key Stage tests.

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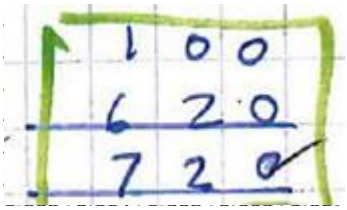

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Aspects of…

Assessment and marking

Three recent documents on marking – Eliminating unnecessary workload around marking: Report of the Independent Teacher Workload Review Group March 2016, Marking and Evidence Guidance for Primary Mathematics Teaching NCETM April 2016, and A Marked Improvement – provide clear guidance on how to ensure marking is manageable.

Effective marking is an essential part of the education process. At its heart, it is an interaction between teacher and pupil: a way of acknowledging pupils' work, checking the outcomes and making decisions about what teachers and pupils need to do next, with the primary aim of driving pupil progress. This can often be achieved without extensive written dialogue or comments. (Eliminating unnecessary workload around marking: Report of the Independent Teacher Workload Review Group March 2016)

1. Lesson design

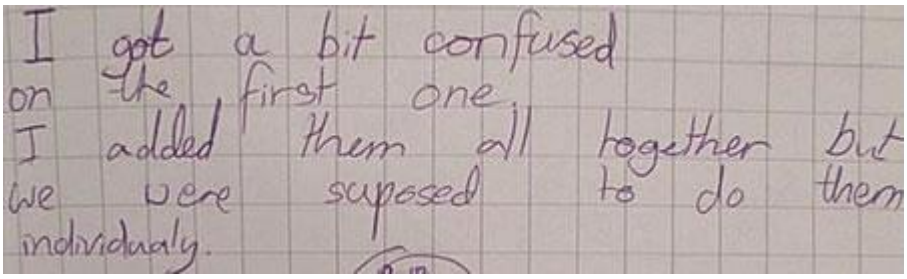
Research (Black et al 2003) shows that the most effective and beneficial forms of assessment are ones which support learning (i.e. are formative) and are built-in to lesson design. In primary mathematics they require:

- *well-structured classroom activities (involving conceptual and procedural variation and intelligent practice);*
- *regular opportunities for discussion of answers and strategies to support pupils' reasoning skills and check and deepen their understanding;*
- *interaction and dialogue (between teacher and pupils, and between pupils themselves), focusing in particular on key ideas and concepts (including misconceptions and difficult points) and effective, efficient strategies of working mathematically.* (NCETM 2016)

2. Self-marking

Evidence shows (Black and Wiliam 1998) that pupils benefit from marking their own work. (NCETM 2016)

Asking children to mark their own work can provide an opportunity for children to reflect on their thinking and understanding, identifying their own errors and misconceptions; this enhances learning and provides rich assessment information. For example:



3. Peer marking

Asking children to consider someone else's work during a lesson can be beneficial if there is an emphasis on explaining thinking, for example:

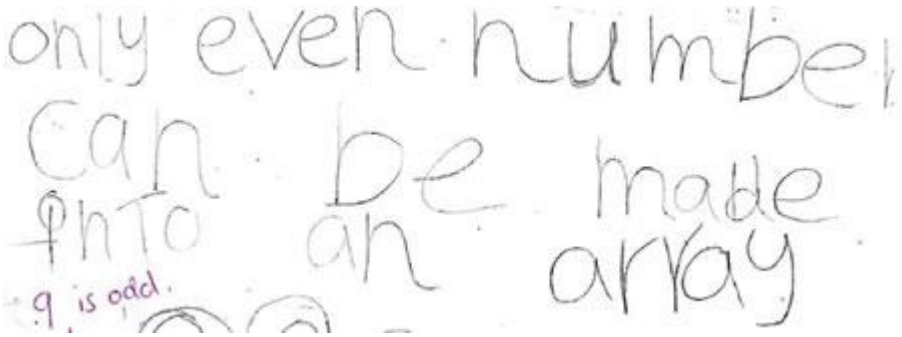
- Saying whether they agree or disagree and why, leading to marking
- Marking someone else's work and finding an example where they:
    - can explain why a solution is not correct
    - can explain how to find a solution in a different (more efficient) way
    - are not sure how the solution was reached and require an explanation

We believe that three principles underpin effective marking: it should be meaningful, manageable and motivating. Marking practice too often responds to myths and fads, rather than focusing on these principles. (Eliminating unnecessary workload around marking: Report of the Independent Teacher Workload Review Group March 2016)

4. Meaningful marking

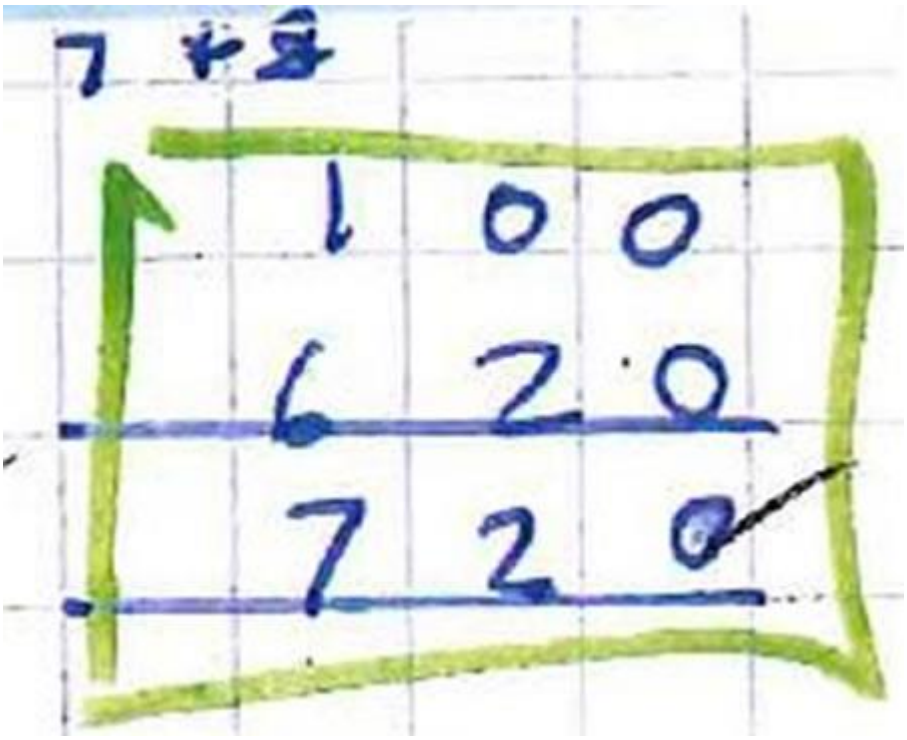
Marking should serve a single purpose – to advance pupil progress and outcomes. (Eliminating unnecessary workload around marking: Report of the Independent Teacher Workload Review Group March 2016)

Responding to children's thinking during lessons is likely to be most meaningful and limits the need for marking outside of lessons. Sometimes the response is oral and sometimes a short comment can be inserted into a child's work in order to disturb or challenge their thinking and move their learning on in the moment. For example:



5. Manageable marking

One simple way to draw children's attention to something in their work is to use highlighting; this does not require any additional comments from the teacher. If the focus is on key elements of mathematical thinking, such as decision-making, efficiency, using what you etc. then this will deepen understanding and support learning. For example:



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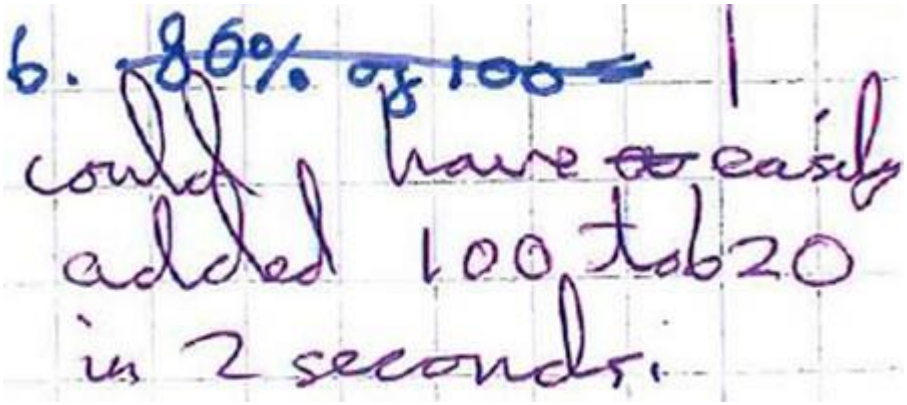
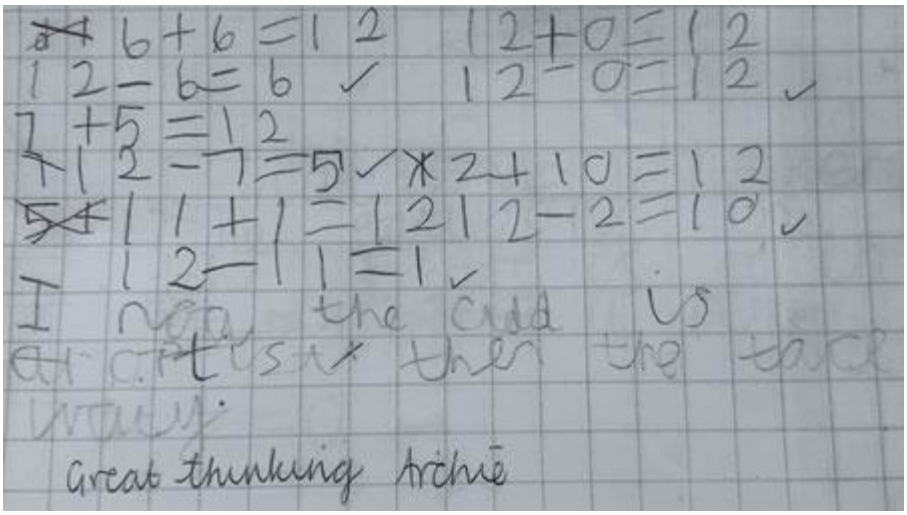


6. Motivating marking

Marking should help to motivate pupils to progress. This does not mean always writing in-depth comments or being universally positive: sometimes short, challenging comments or oral feedback are more effective. If the teacher is doing more work than their pupils, this can become a disincentive for pupils to accept challenges and take responsibility for improving their work. (Eliminating unnecessary workload around marking: Report of the Independent Teacher Workload Review Group March 2016)

The focus of feedback will indicate to the children what is valued within mathematics and is an opportunity to motivate children to focus on what is valuable. This example shows a child capturing their thinking about the mathematics with which they have been engaged and the teacher providing a brief response to indicate that they value thinking, motivating the child to continue to develop this way of working in mathematics.



"I notice the add is opposite than the take away"

"Great thinking Archie"

Thanks to teachers in the following schools for the examples included in this article: Brampford Speke C of E Primary School, Northam St Margaret's C of E (VA) Junior School, Ilfracombe Infant and Nursery School, Beaford Community Primary and Nursery School.

Next time in *Aspects of…* we will look at aspects of preparing for Year 6.

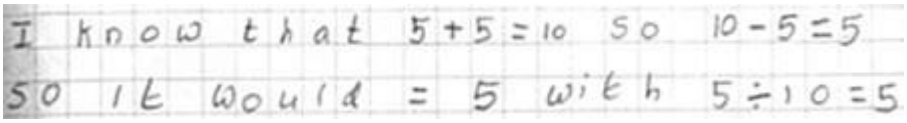
Seen and Heard

Seen and Heard *shines a light, via photographs and conversations from classrooms, on a specific example of the mathematics learning experience, the aim being to stimulate thought and questions about how you would react to similar events in your own classroom*

Responding to

> $^1/_2$ *is equivalent to* 0.5, $^5/_{10}$, $^{50}/_{100}$ *and* 5÷10
>
> *Is this correct? Can you prove or disprove this statement?*

a child wrote this:



- What does the child understand about the relationship between 5 and 10?
- What does the child understand about addition and subtraction and the relationship between them?
- What does the child understand about division?
- Why might they have come to this understanding?
- What would you do next?
- Which contexts and images would you use to support the child's understanding?

With thanks to Emma Craufurd, Ilfracombe Church of England Junior School, Devon, for sharing this example with us.

If you have a thought-inducing picture, please send a copy (ideally, about 1-2Mb) to us at info@ncetm.org.uk with 'Primary Magazine: Seen and Heard feature' in the email subject line. Include a note of where and when it was taken, and any comments on it you may have. If your picture is published, we'll send you a £20 voucher.