

Date	October 2016
Key stages	KS1—KS2
School type	LA maintained, primary
Themes	Mathematics

Using the mastery approach to mathematics

St Paul's Catholic Primary School

Context

St Paul's Catholic Primary School is an average-sized school located in the Broxbourne district of Hertfordshire. The school was rated as 'requires improvement' by Ofsted in February 2015 and is since working on improving certain aspects, including improving standards in mathematics.

Brief Description

Since 2014 the national curriculum for mathematics has been re-designed to raise standards in mathematics inspired by methods currently used in South-East Asian countries such as Singapore, Japan and China. The mastery in mathematics approach is characterised by the principles that all pupils are capable of excelling in mathematics and that pupils progress through the curriculum at the same pace but differentiation is achieved by emphasising deep knowledge through individual support.

At St Paul's Catholic Primary School teaching for mastery in mathematics is about deepening and securing pupils' understanding of mathematics over the long term. The school was not satisfied with pupils 'getting' an approach once and then later forgetting it and wanted them to be able to talk about their maths and reason their answers based on previous knowledge - not just complete pages of calculations without a context.

St Paul's decided to pursue mastery after their latest Ofsted and 2015 SATs results showed that maths teaching and learning was below the expected standards. Pupils were unable to answer cross-domain problems and did not have a secure enough understanding of written and mental methods to be able to apply their knowledge to problems they had never seen before. In light of the aims of the curriculum, teaching and learning needed to change to provide opportunities for pupils to explore their mathematical learning and have the chance to talk about their mathematical thinking. Following support and training from a Herts for Learning Teaching and Learning advisor and an inspirational staff meeting from the Teaching and Learning advisor (TLA), the school made a drastic change in a short space of time and employed the concrete-pictorial-abstract (CPA) model as the basis for teaching. The school worked to get all staff on board and was fortunate that most teachers understood the importance of the change.

Teaching for mastery in mathematics

Differentiation

With the mastery approach differentiation happens through the support and intervention provided to different pupils, not through the topics taught. To remove the ceiling on pupils' learning the school stopped grouping pupils by ability. Differentiation is now achieved through setting a 'red-hot learning challenge' (set at age related expectations) at the beginning of every lesson which all pupils work towards achieving. The questioning and scaffolding individual pupils receive in class as they work through the problem differs, with higher attaining pupils being challenged through more complex problems which deepens their knowledge of the same content. When planning and teaching maths lessons, teachers are aware of where each pupil is and plans questions, tasks and challenges to meet the needs of all of the pupils. Although the challenge is higher to start with, the earlier objectives are the planned steps in getting the pupils to age related expectations. Pupils' difficulties are identified in regular pupil progress meetings and addressed with intervention, which allows the school to work towards closing the gap, especially at Key Stage 2.

Classroom ethos

Previously maths lessons were very quiet, with low attaining pupils having lower levels of confidence and higher attaining pupils dominating lessons. Girls in particular did not participate in and enjoy maths and were underperforming compared to boys. With the new approach all pupils are required to talk about their maths learning. The school puts a huge emphasis on 'talk for maths' in which discussing with 'talk partners' is crucial. Pupils are seated in mixed ability pairs, which change regularly and are encouraged to talk to each other to ensure that those who lack confidence and find maths challenging are not left behind as the more confident pupils take over discussions.

Purposeful planning for mastery

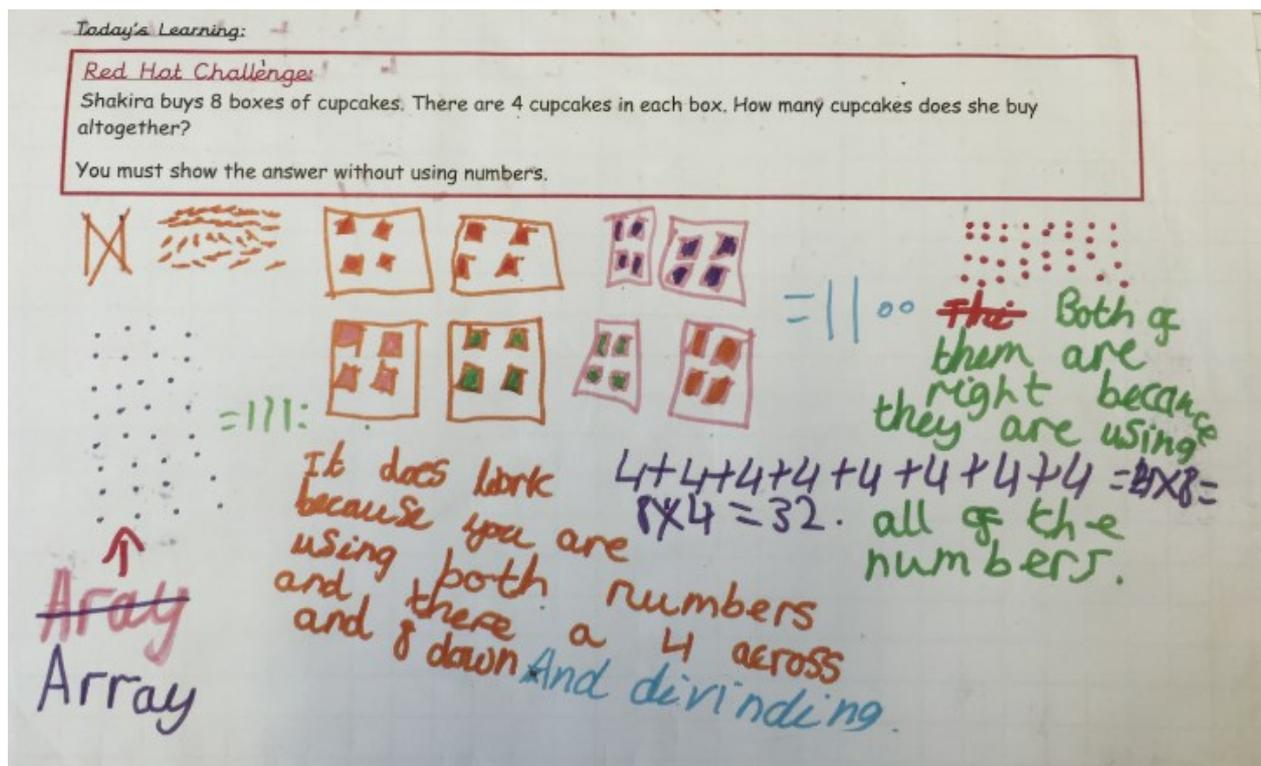
To allow for cross-domain teaching the school moved away from using the domain medium-term planning and started to use immersion planning. This involves teachers planning one lesson at a time using HfL Assessment for Learning to plan the next lesson. The next topic is introduced after all pupils achieve a pre-specified level of mastery of the 'red-hot learning challenge', whether that is after one lesson, two lessons or a week of lessons. Short-term planning focuses on scaffolding to meet the needs of all pupils and ensure that gaps are filled and that understanding is secure and deep. Teachers also plan more cross-domain so that pupils can start making connections and see the relationships between different topics, ideas and numbers, which supports them in their 'talk for learning.'

Embedding the CPA approach

Initially most mathematics teaching at the school was centred upon textbooks and worksheets. To overcome this, the school invested in new resources to support the teaching and learning of the CPA approach; one of the key principles from the mastery approach. This approach suggests that there are three representations necessary for pupils to understand a concept; concrete, pictorial and abstract. With the concrete resource a pupil is introduced to an idea or a skill by acting it out with real objects, for example, solving problems using counting blocks. Pupils pictorially apply those hands-on experiences to diagrams and pictures of the problem through drawing; this could be circling objects for division into groups in their exercise books. The abstract representation is also linked to the pictorial and concrete experiences so that pupils use numbers, symbols and language with greater understanding when representing their mathematics.

Teachers at St Paul's needed a lot of support to understand the CPA approach and teach using the resources effectively, which they believe was the hardest part of the change. At the beginning teachers were asking pupils to prove their answers but were forgetting

the direct teaching as well, but by working with the TLA they became secure with the CPA model and can apply it successfully to their teaching in the classroom.



Child's book demonstrating how pupils solve problems using the pictorial approach and explain their learning journey

Impact

Classroom ethos

Behaviour for learning at St Paul's is significantly improved in mathematics and overall students and teachers enjoy maths more. 'Talk for maths' had a significant impact in creating dialogue and sharing ideas between higher and lower attaining pupils, with all pupils realising they have valued ideas. Pupils can prove their answers by using their previous knowledge and demonstrating what they mean by using the resources. The pupils are now independent learners choosing their own resources to support them and asking each other to prove it. The buzz in the classroom during a maths lesson is great and all children are engaged in their learning.

Purposeful planning for mastery

Planning one lesson at a time is expected to have a crucial impact as it involves teachers identifying gaps more closely. Lesson planning is now directed by pupils with the next maths lesson being dependent on their progress in the last. The change in medium-term to short-term planning has resulted in pupils seeing the relationship between domains in maths and making connections when talking about their understanding. The subject leader in maths at St Paul's is aware that the school has far to go in the planning of mastery which 'doesn't just happen overnight'. Changing the way of planning has been a learning curve for all teachers but despite this it has had a notable impact on teachers and pupils within a year alone.

Embedding the CPA approach

Although still in the early stages, the use of the CPA approach has made pupils more aware of the relationship between different domains and has increased their confidence in maths. In particular the concrete and pictorial approaches have supported girls and lower attaining pupils in excelling in maths. Initially some higher learners and boys in particular, were resistant to using the concrete and pictorial approaches and didn't see why they had to explain their learning journey when they 'just knew the answer'. The school sought to overcome this by maintaining a good balance between concrete, pictorial and abstract and persevering against the resistance of some. It has seen a gradual increase in the amount of boys and pupils requiring further challenge now engaging with the approach. The school is aware it still needs to work further to embed the CPA approach but is confident with the foundations it has laid with it.

Differentiation

Since removing ability grouping some pupils who had previously been labelled as lower attaining are now working at age related expectations. Targeted differentiation has resulted in attainment increasing, with data from May 2016 showing that 90% of pupils are making the expected progress, 20 – 30% higher than last year. A Herts for Learning review in summer term 2016 also showed that the school was doing well in mathematics, attainment was increasing, including the percentage of higher attaining pupils who are now much more able to represent and communicate their thinking and translate meaning to new contexts. As 2015- 2016 was the pilot year for mastery in mathematics at St Paul's, the school expects to make further progress in the coming years, especially amongst that current Year 2s, who would have been taught this for two years at the end of Key Stage 1.

Next Steps

In the coming years the school will continue to embed the mastery approach to support mathematical fluency for pupils. Existing and future teachers will be supported with the new approach so that maths teaching is consistently developed throughout the school

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Related documents and links	www.stpauls373.herts.sch.uk

If you have an aspect of interesting practice that could be shared or are interested in finding out more about a case study please get in touch by emailing exchangingexcellence@hertsforlearning.co.uk

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