

# Number fluency

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To discuss this case study, please contact us via email [customersupport@camdenlearning.org.uk](mailto:customersupport@camdenlearning.org.uk)



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# Key Points

Daily ten minutes on number fluency has real impact on maths

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## Purpose

### What were your reasons for doing this development work?

(The author of this case study is **Joanna Kersey**)

Number fluency is explicit in the aims of the new mathematics curriculum, though there is little detail on how to achieve it in the programmes of study. Our school was involved in the Camden Mathematics Lead Professional lesson study project, and was researching into word problem-solving through lesson study. Number fluency is essential to effective problem-solving in maths, using and applying knowledge related to the four operations (+, -,  $\times$ ,  $\div$ ), so I decided this would be a focus for the year.

I chose to do a MLP 'masterclass' on number fluency in June 2014 because it was a good way to showcase that doing ten minutes daily on number fluency could make such a difference to problem-solving.

### Who were the identified target learners?

My focus group were my Year 6 higher ability maths set, 19 pupils.

### What specific curriculum area did you intend to have impact on?

Maths – Number

### How were you intending to improve pupil learning?

Through a daily ten minutes on number fluency and problem solving, encouraging learners to collaborate, apply existing knowledge related to the 4 operations and always

- think logically
- link back to previous learning
- think about the mathematical skills you need to apply
- discuss possibilities
- find a starting point

- don't be afraid to make mistakes – trial and improvement
- persevere

## What were your success criteria?

That the pupils would develop good number fluency and, at the end of the year, achieve at least level 5 in Maths KS2.

# Methodology

## What did you do - what teaching approaches did you use?

- The ten minutes daily session – not part of maths time but done through basic skills – included doubling, halving, number bonds to 100, number facts, number skills, times-tables, conversions, oral ping-pong, problem solving, dice games, card games, bingo, odd number out (any could be for a range of reasons), quizzes, etc. It's interactive and fun. I had to overcome a real dislike of maths from my own schooling, so I make sure it's fun and positive.
- Understanding is paramount – when teaching new concepts I say, 'If you don't understand, stay on the carpet and we'll go through it again. When you think you are ready, go and get on with the work set. During a lesson, children might say 'I haven't got it – can I come back on the carpet?' There's no stigma to not understanding. It's important to persevere, though – sometimes an able child will give up because they are used to getting things quickly.
- Use of concrete referents – counting stick, number squares, blocks, numicon, dienes, place value grids, number fans.
- Explaining why is highly regarded – 'It's only good if you can explain it to someone else'. I often ask, 'How do you know?' 'or 'Can you prove that?' Questioning is vital, to develop their ability to express their understanding. So is reflection; I try to draw out the learning to make it explicit, and model the language to think about the concepts they are using. I encourage them to make connections : 'If you know 65 and 35 make 100, then you know 6.5 and 3.5 make 10.'
- Differentiation – When marking work, I sort it into three piles: got it/nearly got it/haven't got it. I base the next lesson on that; I know what differentiation is needed. All do the same activity, applied in further ways. I don't differentiate by using different activities.
- Collaborative group work – you can assess learning well by listening to conversations, assessing fluency and the understanding they show. I don't have set groups, children are grouped as needed that lesson.

- Investigations, for example into rules of divisibility, develop their mathematical thinking.
- Times tables Challenge: Across the whole school, children can do a challenge, starting with Bronze (tables 1-5), then Silver (1-10, ordered), Gold (1-12 in jumbled order), and Platinum (involving decimals). The challenge is to be able to complete an A4 sheet of tables in 4 minutes. Individual children come to do the challenge when they think they are ready.

### **What specific teaching resources did you use?**

Counting stick and times tables – see a video

<http://www.youtube.com/watch?v=yXdHGBfoqfw>

Kenken, like Sudoku only with calculations – see Kenken site <http://www.kenken.com/>

Nrich ideas and resources <http://nrich.maths.org>

### **What CPD experiences, materials, research and expertise have you drawn on?**

School involvement in Mathematics Lead Professional lesson study.

## **Outcomes and Impact**

### **What has been the impact on pupil learning?**

Number fluency in the four operations has a real impact on achievement in mathematics. The children have an expectation of being able to solve problems and will try other approaches if they don't succeed. They explain their thinking to each other as they work together. They know they have to justify an estimate or answer and readily have the language to explain.

### **Evidence of impact on pupil learning**

All the target children achieved their target of level 5, and six attained level 6.

### **What has been the impact on teaching?**

I assumed daily practice would make a difference, but I didn't realise how much and how quickly it would have an impact. I hope the children will maintain it.

## **Evidence of impact on teaching**

Number fluency is spreading across the school – chanting tables, doubling, halving, number facts, etc. during the daily basic skills session or the daily 5 minute maths starter. It is becoming part of the new planning because of the new maths curriculum.

## **What has been the impact on school organisation and leadership?**

### **Evidence of impact on school organisation and leadership**

### **What is the crucial thing that made the difference?**

Repetition, making connections (e.g. If I know this:  $6 \times 3$ , then I know this:  $60 \times 30$ ,  $600 \times 300$ ), having fun.

### **What would your next steps be?**

To get everyone on school on board, ensuring that teaching doesn't move on until children are secure in their understanding.

I am preparing a resource showing the key number facts children need to know by the end of each year group.

## **Sharing Practice**

### **If another individual or school was attempting to replicate this work, where should they start?**

Start with number bonds to 10, 100, and key number facts and skills.

### **What would be the essential elements to include?**

Daily practice, having fun, challenging children to explain their thinking.