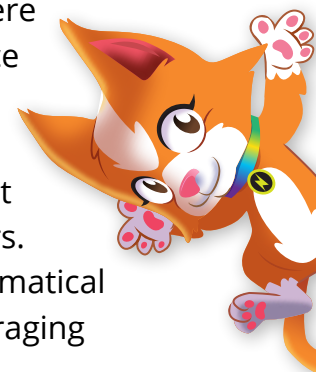


## Section 3:

# Mathematically empowering classrooms



Although the initial focus of the Power Maths Efficacy Study was the implementation of Power Maths in classrooms, we were also able to gather data throughout the pandemic. This gave a vital window into the huge pressures that schools were encountering and the rapid changes to teaching and learning that took place over this time. We were able to chart not only the disruption to learning during this period, but also the ongoing impacts of this on pupils. In this context we identified key approaches to teaching and learning that were felt to be effective, and some key barriers experienced by students and teachers. We saw Power Maths was viewed as playing a key role in supporting mathematical mastery as well as problem solving and reasoning. It was also key to encouraging pupils' mathematical confidence, enjoyment and resilience.

## Mathematical mastery

Importantly, teachers valued Power Maths as a tool which gave consistency and support both to pupils and teachers.

“ I think it is the structure of the lessons, the children really respond to that because... they do go into that reasoning and that problem-solving approach, and just embedding it.

School 9, Year 6 Teacher

“ I think it's just the structure of [Power Maths], the fact that it is quite clear what's expected... Which makes the children familiar with it, the staff are able to have something to go from. I think that's the real strength.

School 9, Year 6 Teacher

The structure and content of Power Maths was seen as enabling teachers to move towards a mastery approach

“ I would say within a lesson, you can see the build-up, especially in terms of the representations and images and scaffolds that are in place. The initial questions will be very heavily scaffolded, and then as the lesson progresses, that does peel off, but when you go back to the task, it starts again with the heavy scaffolds... I find that generally the contextual variation... to really expose the mathematical skill, I think that's really good.

School 18, Year 6 Teacher

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“ *It all follows on, and they cover all the different aspects and it all leads on... quite nicely... It does build it up, and you can see how things have been built up through the years.* ”  
School 19, Year 6 Teacher

About half of schools felt that children’s mastery of maths was progressing well, and some noted that Power Maths supported this, especially where teachers were familiar with Power Maths materials.

“ *I would say [that children’s mastery is progressing well] and I think that’s down to the way that we structure it. Because every day they have a reasoning question... we’re looking at the skills application that can then be applied over a range of subjects.* ”  
School 18, Year 4 Teacher

“ *I think the Power Maths schema work, and the coherence and the sequencing, and the models of the representations that go throughout the school, that’s really strong.* ”  
School 19, Maths Coordinator

### Problem Solving

Power Maths was also seen by many teachers as supporting pupils to engage with mathematical Problem solving and reasoning, as well as supporting their development of mathematical communication.

“ *Because it’s so encouraged in the Power Maths book, I think the use of mathematical language to explain what they mean... has been a strength... they’re able to just say exactly what they mean and everyone else understands because we’ve all promoted the use of that vocabulary.* ”  
School 5, Year 4 Teacher

“ *I do think the books provide this challenge with the [larger] questions and they’ve all certainly also gotten into the routine of... by the end of the unit you have mastered the skills, then it’s all about applying them to problem solving lessons and that’s the pattern for every unit and I really like that.* ”  
School 5, Year 4 Teacher

“ *It’s definitely the strategies that are taught through Power Maths that help them in the problem-solving.* ”  
School 19, Year 2 Teacher



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Barriers to pupils engaging with problem solving and reasoning included a lack of fluency, and the linguistic demand of some questions.

### Empowering all pupils to access complex questions

In response to feedback around linguistic demand and wordy questions, the volume of text in Power Maths materials has been cut down as far as possible in the new edition, whilst retaining a strong focus on problem solving and reasoning throughout. Teachers are encouraged to place a real emphasis on mathematical language, so that this doesn't present a barrier to children accessing this content.

## Manipulatives and mathematical learning

Teachers highlighted the importance of manipulatives in supporting children's learning, although use of manipulatives had been disrupted in classrooms during Covid-19.

“ Towards the start of the unit, it's a lot more equipment-based, group work, discovery. And a normal lesson, I think, would be we would do our maths “morning meeting”, we would have some discovery time with equipment.  
School 5, Year 4 Teacher

“ I think the geoboards definitely helped. They like practical resources, we had lots of mini cubes out for algebra, which really helped show them what they were doing. They also, I was really pleased to see, they got out their times tables squares themselves.  
School 13, Year 6 Teacher

### Using manipulatives in Power Maths lessons

Power Maths supports the use of manipulatives through clear pictorial representations of the resources children could use. In each lesson children can explore the 'Discover' questions with manipulatives and then discuss the benefits of different approaches as a class, using the 'Share' page.

The image shows two pages from a Power Maths lesson. The left page is titled 'Counting in 100s' and has a 'Discover' section. It features a cartoon character standing next to a display of dice. Below the character are two questions: 'a) Count the dice on the ground. Is this the correct amount?' and 'b) How many dice are there in total?'. The right page is titled 'Share' and has a 'Share' section. It features a cartoon character and a grid of dice. Below the grid are two questions: 'a) We can count the dice. I made groups of 10.' and 'b) There are 100 dice on the ground. This is the correct amount. There are 100 dice in each jar. How many dice are there in total?'. Below the questions are three jars labeled '100', '200', and '300'.

## Fluency

Fluency was identified as a key focus for schools. Although some schools felt they had succeeded in supporting their children in developing mathematical fluency, others noted that this was an ongoing challenge. Teachers were often adding extra support around fluency into lessons, sometimes using additional resources.

“ There’s still some [pupils] struggling [with]... recall of even number bonds quickly and reliably and that of course impacts on their other learning then. Others have got all times tables sorted, they’re confident, they’re quick.  
”  
School 13, Year 6 Teacher

“ I think that’s what the children at our school definitely need. I think they need to show that they’re really fluent in those maths skills before they apply it to the work problems, and that’s going to be something that we’re going to be seeing next year.  
”  
School 11, Maths Coordinator/Year 6 Teacher

Lack of mathematical fluency was for some students a key barrier to engaging with problem solving and reasoning and an area where some schools felt greater support would be useful.

### Power Maths: increasing focus on fluency

Many schools build in extra fluency practice outside the main maths lesson, e.g. during a short afternoon maths meeting, which can help reduce barriers to accessing the core learning.

The new edition of Power Maths puts increased focus on fluency and provides additional resources.

## Pupils’ learning habits

Pupils’ mathematical confidence, enjoyment and resilience were areas that teachers identified as being strongly impacted by Covid-19. However, teachers were positive regarding the recovery both in students’ attitudes to mathematics and in their learning habits more generally. Support provided through Power Maths was seen to have played positive a role in this recovery. Children in participating schools were able to reflect on why different approaches supported their learning. They recognised that ‘getting stuck’, and talking and writing about their mathematics, enhanced thinking, and enjoyed engaging with a range of approaches to questions.

## Section 3: Mathematically empowering classrooms

“ They’ve taken a bit of a knock, haven’t they, the children, and I think their confidence is also a bit lower than it would normally be. So, it’s just spending a little bit more time sometimes, putting the brakes on.... If there’s a gap that comes to our knowledge through teaching, then we stop and we teach that.

School 11, Maths Coordinator/Year 6 Teacher

“ I am happy that my Year 4 cohort are going up to Year 5 with really strong habits embedded in their maths lesson.

School 12, Year 4 Teacher

Children’s positive attitude towards mathematics was evident in how they engaged with Challenge tasks. Challenge tasks are pedagogical devices that routinely occur at end of a lesson and are designed to stretch children mathematically.

“ Interviewer: What about if you actually get a Challenge question right? How does that make you feel?

” Student: It just makes me feel good inside.

School 19, Year 4 Student

“ It takes a lot of work to get there, but you feel a good sense of accomplishment once you’ve finished it.

”

School 5, Year 6 Student

