The NCETM Podcast Episode 71

Maths vocabulary

Hello and welcome to the NCETM podcast. I'm Julia Thomson [JT] from the NCETM Communications Team. Today I'm going to be speaking to Victoria Moore [VM], Maths Lead at Usworth Colliery Primary School in Tyne and Wear. I spoke to Victoria a few weeks ago about her school's journey towards a mastery approach in maths.

JT: One of the things that really interested me when we spoke was the impact on vocabulary and children's speech and language that taking the mastery approach brought about in her school. I think it's a topic that teachers will be really interested in.

So thank you for talking to me today, Victoria.

First of all, can you tell me a little bit about you, your school and its context?

VM: I've been Maths Lead at Usworth Colliery since about 2016 and I've really seen this journey from mastery all the way through, from Mastery Readiness to being a Mastery Specialist now.

We are a two-form entry primary school in the North East of England, so we go from Reception right up to Year 6, and we also have within our setting an ASD base, so we have children from across the authority who come and access our school, in the mainstream lessons and also in some very specialised provision as well.

We've got a Thrive provision too for children who have got quite severe EBD needs, and both of those provisions are expanding in September, so it's a really interesting and lively school to be in.

We're in the North East of England, we're an old colliery town and we're an area really of quite high social deprivation. We've got around about 47% of children on Pupil Premium at the moment and within that, some of the children have got a real variety in the support that they access at home, but we tend to find that often they can lack really high-level academic vocabulary input at home, despite having other support. So really that's why that was such a big push for us to work on this year.

JT: So, for those listening who are unfamiliar with teaching for mastery, can you explain how the use and teaching of mathematical language is different from how it might have been previously?

VM: Yes. We've used various different schemes over the years, various different resources or textbooks, and really the whole approach for us adopting the NCETM prioritisation curriculum has been the biggest change, because that really does push a very high level of mathematical vocabulary. Previously we've found that children struggle to reason about what they're learning in maths because they might lack some of the appropriate terminology.

The prioritisation curriculum pushes that up to the next level and it really gives the children the language and the terminology that they need to be able to reason accurately and take sort of 'wooliness' away from them.

We also find that stem sentences and generalisations are really, really embedded in these materials, and they really support our children through reasoning through maths, and this ambitious terminology, which sometimes seemed a little bit counterproductive when we know our children lack a breadth of vocabulary, to suddenly give them all these high-level terms. But, actually, it's really focused their thinking and their ability to reason by being able to use the correct the correct terminology.

JT: And just as a bit of context for people listening, the language is very ambitious, isn't it? There's language that many adults, many teachers, wouldn't necessarily understand.

VM: Yeah, we've got children in Key Stage 1 who are using the word 'commutative'. We've got children who can explain the difference between the distributive and the associative law of multiplication.

Regularly, children can talk about dividends, divisors, quotients, subtrahends, addends, something that we might touch on in Year 1, children using augmentation and aggregation in their everyday maths lessons, which just seems mind-blowing. But it's really helped them to think about the structure of maths and what's actually happening, the things that they're doing, by having the correct terms to use.

JT: So it's not just kind of performative, using this language just for the sake of it - there's actually a real purpose to it, it's helping the children to actually understand what's going on in the maths.

VM: Yeah. To see the structure either of different operations that they're using or what's happening with the fractions when we're breaking wholes up into different pieces. They've really got that ability to get to the minutiae of detail by using the appropriate terminology.

Don't get me wrong, this isn't 'we've introduced it and miraculously overnight this has happened', we've had lots of pushes on oracy in school in general and how we build confidence in children speaking, but having the terminology has really helped to develop the mathematical understanding as well.

And we're not definitely there yet: we've still got children who are working on this, but we have noticed a big, big impact since we've been working on this.

JT: You are in an area of deprivation. Your children are going to be quite language-poor and I think when we spoke we would be discussing their backgrounds, the type of conversation and language that they might hear at home and how that they were behind some of their peers nationally in terms of their levels of language. So you, as a school, it's not just in maths that you're looking at - obviously it's also across the curriculum. Is that right?

VM: Yeah. I think we've used the concepts such as Launchpad for literacy and across Key Stage 1 other sorts of communication qualifications that some of the staff in Early Years particularly have worked on to try and just bring that general communication up and about.

But we do notice that subject-specific vocabulary is a real area for us to continue to develop in school and since we've introduced that in maths, it's been really nice to see it go across the curriculum and into other subjects. So the children are using now more subject-specific vocabulary in history and geography and art and music, and to really bring that about because we've seen the benefits that it can have when children can articulate properly what they're thinking.

JT: You've touched a little bit on the impact that adopting a teaching for mastery approach has had on pupils' language and oracy. What's that been like for teachers to deliver? Because I imagine that there would have been some nervousness. We talked about some of the language, I'm not familiar with, so how have teachers felt about starting to deliver that language in terms of their own confidence and subject knowledge?

VM: I think the big thing to say is that the staff at Colliery are absolutely brilliant and we are a really big team and they've taken to this change really, really positively. And I can only thank them immeasurably forever for that.

I think the first thing to say is that we went about this this change quite gradually, so we trialled it in some year groups first, especially with taking away the scheme that we were previously using and to go towards the prioritisation curriculum. That meant initially quite a lot more work for staff, so we trialled it in a few year groups first, and I think the staff just saw the benefit.

Initially they were really apprehensive and thought 'this is a lot of work to do and it's taken me a lot longer to plan than it is just to pull something off the shelf and twiddle with it.'

Initially there was a little bit of 'oh I don't know if I'm going to be able to do this and I don't know how long it's going to take' and then really within a couple of weeks they were coming back to me and saying 'my lessons are

going so much better, and the children are really taken on board this vocabulary and it's really helping them to understand.'

The stem sentences are absolutely immeasurable in terms of the impact they've had, and I think the stem sentences have been a big thing for all staff because they've helped staff to learn some of that terminology and understand some of those structures a bit better as well.

So yes, you're right, there was definitely some nervousness at first. And like I said, I can only thank them because they've really had to do a lot of learning themselves. For us using the PD Materials from the NCETM has really helped as well, because alongside some of the representations and structures that they suggest you use to teach children a concept, they've got a wealth of CPD in there. So apart from, really, everybody in my school becoming a Mastery Specialist, all going on to some of the local Maths Hub subject knowledge courses, that CPD in the booklet is really, really helpful because it it gives you all of that background that you need and explains the terms and how that links to the representations that you're going to show the children.

JT: So can you talk a bit more about the impact that you've noticed then in school in terms of this approach to vocabulary?

VM: I think the first thing that I did really for that was speak to staff and find out what they had thought. And one person just came back and said, talk, talk, talk. All we do is talk in maths a lot now, and we tried to really remove some of the pressure of going straight to formal recording. And if you've listened to this podcast, you've heard Debbie Morgan speak and you've heard about the value of children really understanding the mathematics before they just go straight to writing things down.

So for us, it's been a lot of that talk together, and the stem sentences are so, so valuable because they give children a frame to be able to speak, and that really helps them to understand what's going on. Through this constant, 'I say, we say, you say, tell your partner, tell somebody else, tell me, explain what you mean.' Through all of that talk, those stem sentences become an internalised way of thinking, so children can put that reasoning into their own work much more independently.

The generalisations as well, I think, which some of these stem sentences lead to, really help the children to come up with their own rules and to come to their own conclusion about what's happening, to spot patterns and really, really take that maths much deeper than perhaps if we weren't using a lot of this oracy and mathematical talk.

Another thing that we've come across has just been the way that those stem sentences translate to writing, so that if children are asked to record their thinking, that's much more fluent and natural than perhaps it had been because of that frame for thinking.

It means that they're not fazed about talking about maths now, they don't have to really think a lot about what to say because the stem sentences are there, the vocabulary's there and they just have to put that together with the subject or the topic, or the concept that they're looking at that time.

And our other Year 1 teacher had said that she's noticed that it really gives the children who previously had been less confident, more confidence.

It's not just been that children who are already typically good at maths are getting better and everybody else is being left behind, it's helping to keep everybody together and move much more in line with each other and narrowing the disparity and confidence between the groups of children as well.

JT: That's wonderful to hear. So it's like a more equitable way of making sure that everybody's able to access the same mathematics, it’s just giving everybody those skills and tools to be able to do the maths.

VM: Yeah. And that's what mastery is all about, isn't it? About everybody moving together and there not being a chasm between previously rapid graspers and those who just didn't get maths.

JT: Yeah. I think some of the criticisms of mastery is that it can be very rigid and that everybody's slowed down and some teachers don't really like that.

It feels it's different to the way that maths has been approached in the past where everything's differentiated and you've got to constantly worry about pushing your higher-attainers, but this is much more about giving everybody the language and the tools to be able to do the maths and you haven't noticed that maybe your higher-attainers are more frustrated by having to repeat these stem sentences and that sort of thing.

VM: Absolutely not. I think sometimes it's those real quick mathematicians, children who do grasp number very quickly: a lot of teachers will tell you that they're the children who struggle to reason because you ask them what they've done, and they'll just say 'I did it in my head', or' I just know the answer', and actually they can't explain always what they've done.

So that sometimes they get to more challenging maths or they get to more deep problems or they have to connect different content domains together and they really struggle to do that, because it's almost like they've just repeated what they know rather than having to go through that explanation or that reasoning process.

These stem sentences really help those children as well, who perhaps didn't have the language, but who had the innate mathematical ability.

I think when you talk about differentiation, it's not that there is no differentiation within mastery, I think that sometimes is a bit of a misconception.

Yes, it's everybody working on the same things together and that equitable delivery as you say, but that's not to say that there wouldn't be scaffolding in there to support children. There wouldn't be use of representations or concrete materials or support from teachers or peers, just as it's the same that there might be a push to take mathematics a little bit deeper to think about rich problem solving or to find all the possibilities; again, stem sentences and mathematical language for that is really important, because children can then explain how they know they've worked systematically or how the strategy that they've used to solve problems through using stem sentences, and having that high-level vocabulary helps them to push that thinking a little bit deeper as well.

So it's not just that everybody's going to be kept together with the same words at the same time, there are other mechanisms that we can use to support and to stretch and to deepen.

JT: Do you do any explicit teaching of certain mathematical terms, and if so, how do you go about this?

VM: Yeah, we do because as we've mentioned, the children don't automatically come in with those terms. My Year 5s didn't come in knowing what a dividend or a divisor or a quotient was, so we do explicitly teach those. We would teach them alongside the expressions or the equations and we would refer to them, we'd use the stem sentences, we do a lot of 'we say, you say, I say' not in that order necessarily - 'I say, we say, you say.'

Something else that we have worked on in school has been this idea of pre-teaching. We have two different types that we would do in school.

Sometimes it might be a couple of days before a lesson that's coming up, and and it might be something new that the children have never experienced before. We might know that there are some children who just need a little bit longer on that. We've got some really, really brilliant teaching assistants in school who work with the children beforehand: they teach them the vocabulary, they teach them what it means. They might look at some of the stem sentences so that the children come into the lesson feeling a bit more confident, and they're not going to be ambushed by these gigantic terms.

The other type of pre-teaching might be in the weeks before we know we've got a block coming up: the children might go through and perhaps consolidate some of the prior learning from the previous year group, and we know they might need a little bit of help just to catch up, and again the vocabulary and the language within that would be really important.

Our teaching assistants do a remarkable job of pre-teaching our children before they come in to a lesson. Another thing we might look at would be the use of Frayer Models when we're introducing concepts or when we think about what a fraction is, we might look at defining it, we might look at the characteristics of examples and non-examples, and again within that, the vocabulary is very important because we want to be specific and really build that language up around the whole idea of the concept.

Where practice works best and we tend to find that staff have got working walls that would display that vocabulary, and perhaps as I mentioned, we have quite a level high level of SEND need in our school, so sometimes that might be practised in colourful semantics, if that's been identified as a strategy for particular children, and also have a vocabulary display wall that's built up over the year, so it's there for children to refer to and hopefully try and help them to embed that into their long-term memory.

JT: Well, that brings our podcast to an end today. I hope you found it interesting and thought-provoking. I'd like to thank Victoria for speaking to me and sharing her insight and experiences. And thank you for listening. All of the resources mentioned by Victoria are free from our website and you'll find links to them in our show notes. If you've enjoyed this podcast, please do share it with colleagues and follow us wherever you get your podcasts to make sure you never miss an episode.