Secondary Maths Hub Blog – Workshop 1

Mastery is a word that is everywhere you look at the moment if you are interested in maths education. It has been a journey for me to try to understand exactly what people mean by it and different people mean different things when they use it: some are talking about a philosophy for maths education that is founded on the idea that every student is capable of learning maths in a deep, connected way; others take it to mean that students should fully 'master' a concept before they move on to look at new concepts; for some it is a collection of pedagogical tools that they have in their toolkit and employ at different times in different ways.

Words have power and 'mastery' is one of those words that, if used correctly, can help us come to a shared understanding of what makes good maths teaching. A lot of what effective teachers do is hard to see. A lot of the knowledge they have is tacit and some of the time they don't even know themselves how they came by that knowledge or aren't consciously aware that they are using it. An inexperienced teacher observing an experienced teacher teach a good lesson is often at a loss to explain or capture what it is about the lesson that makes it good. It can seem like magic or like the teacher just 'has what it takes' to deliver good learning. In my role as a Lead Practitioner that isn't good enough. I need to find ways of bottling the

effective things that teachers do and making them learnable and transferable. Having a shared language is a really important part of that process.

At the first workshop for the Camden Learning Secondary Maths Hub, myself and Clare James used the word 'variation' to mean something specific about the way we plan learning activities. Just having this word is so powerful. For years I have been learning to discern between what makes a question that has a high impact on learning and a question that doesn't take the learning anywhere new; what makes an activity that really stimulates thought or an activity that just encourages repetition or rote learning. I can show people activities that work for me but for them to understand what is so provocative about them they need to use them with students, maybe several times, and maybe with it not working every time before they start to see what is so powerful about it. Having a shared vocabulary about the real specifics of the crafting of activities is a key to unlock people's potential to take control over their own planning and to craft lessons that work well for their own classes to move them forward.

Procedural variation is a simple idea. You thoughtfully build questions where each subsequent question varies in one particular way, taking care to keep certain aspects invariant. Varying too many things can be confusing and tends to focus students' minds on the method they are using or on a fixation with getting the correct answer. By carefully varying aspects of the questions we start to draw students' attention towards the underlying structure of the mathematics. Students start to see patterns and discern the

effect that the changes are having on the solutions. For example:

291-81

295-85

290-80

189-79

289-79

1289-79

Here the students might start by using a written subtraction method, but soon they start to see that the solutions to each question are the same or that there is a pattern to them. It is at that point that the mind starts to focus on the structure of the numbers: we start to think about subtraction, not as a method of calculation, but as a difference between two numbers. Adding something to both of those numbers doesn't affect the difference between them. This is one way maths teachers want our students to be able to think about subtraction. If the subtraction questions had been random and not carefully thought about then the students would only be focussed on, and possibly constrained to thinking about, their chosen method for 'performing' a subtraction.

Of course, designing a sequence of questions is not in itself a recipe for a great lesson and Clare spoke about the pedagogy involved in drawing our students' minds towards what we want them to see. Using particular questioning

techniques and silent exposition she showed us one way of presenting a lesson on prime factorisation in such a way to draw out the patterns and relationships inherent in the mathematical structure.

The workshop got people thinking about ways that they could plan questions carefully for their lessons and participants chose a topic that they were planning to teach over this half term and started to draft some activities, using examples from various places as inspiration. The idea now is for teachers to go back to their schools and try some of the activities and pedagogy we have shared and planned together and record their reflections and their students' thoughts.

The discussions and conversations that arose from these attempts at variation were really interesting, but for me what was powerful was that we could start to use this shared language to analyse and perfect our ideas to a deeper level. Variation is a word that could mean many things: thinking carefully about our questions; being interested in something structural; having a specific learning point to focus students minds on; and there are other forms of variation than procedural variation but I found the session so useful because when we come back next time and teachers are showcasing some of the work they have done we will be able to get into the subtleties and nuances of the lesson design more quickly because we have this common vocabulary for a particular pedagogical technique.