

## Session Plan

### Secondary Mastery Big Idea: Variation

This professional development module is one of a suite of six modules designed to introduce secondary maths trainee teachers to the NCETM's Teaching for Mastery 5 Big Ideas. Each module shares a rationale, key messages and at least one practical strategy suitable for novices to adopt. Together, the modules form an introduction to teaching for mastery for the novice.

<b>Goals</b>	To help trainee teachers (TT) to: <ul style="list-style-type: none"><li><input type="checkbox"/> understand the what, why and how of variation</li><li><input type="checkbox"/> consider some practical examples of variation</li><li><input type="checkbox"/> practise using variation in teaching.</li></ul>
<b>Starting points</b>	TT will have seen the teaching for mastery diagram with the 5 Big Ideas in the Introduction module. They may have come across the term 'variation theory' and may have formed preconceived ideas of what this means (for example they may have come across Craig Barton's variation theory website.)
<b>Materials required</b>	PC & projector Whiteboard or flipchart & pens Group set of mini whiteboards & pens
<b>Time needed</b>	90 minutes (option to remove Strategy 2 to reduce time)
<b>Room layout</b>	Room layout should accommodate TT working in pairs and groups of four.

**Suggested approach** Share Teaching for Mastery framework (S2) and highlight that this session will explore Variation.

### **Exposing rationale (5 minutes)**

Watch the Monkey Business Illusion video (S3) to provide rationale for variation. Did TT notice the player leaving or the curtain changing colour? “When you’re looking for a gorilla, you often miss other unexpected events”. Variation helps us to better focus student attention. Share quotes from Askew and McCrea.

### **Key messages**

Share the key messages (S6) allowing TT time to read page 1 of handout.

### **Practical application**

Two techniques (S7) drawn from Variation Theory: one aspect of procedural variation (often in itself called ‘Variation Theory’) and concept/non-concept (sometimes incorrectly referred to as example/non-example) will be explored.

### **Strategy 1: Procedural variation (30 minutes)**

Ask TT to complete the three exercises (S8) on page two of the handout. When complete, ask TT to order them in terms of which would be most effective in their teaching (most effective first). Ask them to display their ranking using mini whiteboards. (It is likely that most TT will display ABC or BAC).

Share Anne Watson commentary with group from slide notes.

In summary, A can be referred to as normal practice, which can be seen in many textbooks. B begins with normal practice and builds to generalisation. C is an example of an aspect of procedural variation. All have their place - exercise C helps students get to grips with the concept of gradient. The subtle variation draws attention to the meaning of gradient, and therefore enables the learner to make progress towards understanding gradient. (Plot line segments using Geogebra to further this understanding).

Share Gu and Watson quotes.

Clarify key ideas (S11)

One way to use variation in practice sets is to strategically vary one thing, keeping everything else the same so that the underlying structure of the concept is exposed

Prompt students to attend to the variation by asking ‘what is the same and what is different?’

The examples may appear easy at first glance

Exercise C does not show variety. Exercise A is variety.

Ask TT to practise this strategy by working in pairs to create an exercise for expanding quadratics (S12). Once complete, ask them to compare their exercise with another pair. Share exemplar (S12) and ask TT to complete and comment.

The role of the teacher (S14, S15)

Stress that a carefully planned task involving variation is only likely to be effective for student learning if it is used well by the teacher. Skilful sequencing of tasks and questions, anticipation of student learning, and handling of student responses form a complex and high level set of skills that lie at the heart of good teaching and take time to develop!

### **(Optional) Strategy 2: Concept/non-concept (20 minutes)**

Share scenario (S16) and ask TT to discuss in pairs. A student asks you what a radius is. What do you say/do? It is likely that TT will share a definition and/or a diagram with students. (S17) shows a set of concept/non-concept examples for the topic of radius. Model the sequence saying This is not a radius. This is a radius, etc.

Using examples in this way is more effective than trying to explain in words. Words can be misconstrued, as can examples; so, we must urge caution – our examples can embed misconceptions – we must ensure we offer a full range of examples including boundary cases (see the last example). By providing examples of what the concept is, and what the concept is not, we help students gain a deeper understanding of what the concept is. Share quotes (S18).

Ask TT to practise this technique by creating a set of concept/non-concept examples for prime numbers (S19).

Once complete, ask them to compare their set with another pair.

Share exemplar (S20) and ask TT for comments. Note that we used concept/non-concept to gain a better understanding of procedural variation! (S21). Exercises A and B do not exemplify the concept, exercise C does. (Although to fully understand the concept using this strategy, a full range of examples would be needed).

### **Summary**

Returning to the key messages, discuss in pairs how the two techniques address these.

**What TT  
might do  
next**

Close with quote from Craig Barton and more information (S23) and encourage TT to connect with the NCETM and their local Maths Hub (S24).

Create an exercise using procedural variation or a set of concept/non-concept examples which can be used in a lesson.