

## Notes for Unit 4: Representation & Structure

<p><b>Purpose of this unit:</b></p> <ul style="list-style-type: none"> <li>• Identify what we mean by representation and structure</li> <li>• Identify why representations and structures are important aspects of mathematics pedagogy</li> <li>• Identify how to select appropriate representations for a given structure of mathematics.</li> </ul>	<p><b>Materials in this unit:</b></p> <ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Copy of pages 20-25 Improving Mathematics in EY/KS1 Guidance Report</li> <li>• Copy of pages 10-13 Improving Mathematics in KS2/KS 3 Guidance Report</li> <li>• Copy of page 3 EEF: Improving Maths in KS2/3 A self-assessment guide.</li> </ul>
<p><b>Approximate time to complete the unit:</b></p> <ul style="list-style-type: none"> <li>• Three and a half hours.</li> </ul>	<p><b>Resources needed during the session:</b></p> <ul style="list-style-type: none"> <li>• Access to Numberblocks episode <u>Numberblocks Double Trouble S02 E24</u></li> <li>• Copy of pages 20-25 Improving Mathematics in EY/KS1 Guidance Report (one between two)</li> <li>• Copy of pages 10-13 Improving Mathematics in KS2/KS 3 Guidance Report (one between two)</li> <li>• Copy of page 3 EEF: Improving Maths in KS2/3 A self-assessment guide</li> <li>• A selection of manipulatives e.g. Dienes, counters, Numicon, Cuisenaire, multilink, tens frames, buttons, shells etc.</li> <li>• Post-it notes.</li> </ul>

Suggested timings		Overview of the session for the leader
Mins	Slides	
5	1-4	Introductory slides – repeated in each unit. This slide shows the Five Big Ideas and provides the opportunity for you to set the context for this module.
10	5	You may want to pause and ask trainees to consider their current understanding of representation and structure before moving onto sharing the text from the NCETM, to have a shared definition to work on during this session.

10	6	<p>This slide reads out the calculation six add four, and the question ‘How would you show this?’ is deliberately worded.</p> <p>Invite trainees to show this calculation in a range of ways, utilising a range of resources. Share the range of responses and the variety within the room. Invite trainees to discuss if they have used a manipulative or a representation and what the difference is. The aim of this slide is to start to exemplify the difference between manipulatives and representations.</p>
5	7	<p>This slide defines the difference between manipulatives and representations. Trainees may want to revisit what they have used and define each one.</p>
20	8-10	<p>This activity is designed to utilise the research to confirm the importance of manipulatives and representations across the key stages. Working with a partner, one person reads the EY/KS1 EEF document and the other reads the KS2/KS3 document. They jot down the key messages in their section of the Venn diagram and then look for common features. These are then shared.</p>
10	11	<p>Trainees pause to consider what they have seen in practice that relates to the points raised.</p>
10	12-13	<p>We are now moving on to explore doubling and how structures and representations support the learning of this concept. This slide is an example for the trainees to work through, and then to think about what understanding is needed to double.</p>
15	14-16	<p>This is an example where an ‘attractive’ image has been selected. Trainees are asked to consider how this helps support the development in understanding of the structure of doubling.</p>
10	17	<p>Trainees are asked to watch an episode of Numberblocks (‘Double Trouble’) and consider how this supports the development in understanding of the structure of doubling.</p> <p>What is the same as/different from the cauldron example?</p>
10	18-21	<p>These slides are designed to ask the trainees to consider how to represent and record doubling.</p>
10	22	<p>Trainees reflect on where they have seen representations in practice and how these are valued in classrooms.</p>
15	23-25	<p>These slides link to learning theories (Bruner/Haylock) and highlight that this is not a linear progression.</p>
10	26-28	<p>These slides return to doubling this question. This time the question is phrased to consider scaling. Trainees are asked to consider what is different about this question and how they might represent scaling.</p>
10	29-31	<p>These slides show some ways of representing scaling.</p>

10	32	This slide repeats some of the key messages and provides another reflection space for trainees.
10	33	The EEF self-assessment guide (page 3) has a section relating to the use of manipulatives and representations. This may help trainees in identifying specific actions to move their practice on.
15-20	34-37	These slides are designed to provide a very brief overview of some the key representations that trainees see in schools. Some slides from the PD materials have been included to exemplify these. You may want to develop this section further.
10	38-39	These slides refer to some materials the Secondary Team at the NCETM have produced. There are a series of work documents that are very helpful reading, and which provide an overview of that particular representation. It is worth signposting the trainees to these, with the caveat that the activities may not be appropriate.
5	40	This slide provides a summary of the key considerations for practice from this session.
	41-43	The final slides make reference to the NCETM and the work of local hubs, plus some additional reading sources.