

EEF: Improving Mathematics at Key Stage 2 and 3 - Guidance Report

Dena Jones, Evidence Lead in Education

The EEF brought out their first guidance report for maths back in 2017. As maths leader for my school, and more recently a Year 6 teacher, this report quickly became a litmus test to score our maths approach against. Ensuring we were aware of and applying the guidance was a continual and evolving task for all our teaching team. Over three instalments, I will aim to unpick the report, line it up against my understanding of cognitive theory and curriculum design and finally explain how we have adapted and refined our practice to take the most from it.

The report itself has eight main recommendations each split into various aspects within the elements.

Improving Mathematics in Key Stages Two and Three – Recommendations Summary							
1 Use assessment to build on pupils' existing knowledge and understanding	2 Enable pupils to develop a rich network of mathematical knowledge	3 Use manipulatives and representations	4 Teach pupils to solve problems	5 Develop pupils' independence and motivation	6 Use tasks and resources to challenge and support pupils' mathematics	7 Use structured interventions to provide additional support	8 Support pupils to make a successful transition between primary and secondary school
<ul style="list-style-type: none"> Assessment should be used not only to track pupils' learning but also to provide teachers with information about what pupils do and do not know. This should inform the planning of future lessons and the focus of targeted support. Feedback is essential if teachers are to respond effectively to assessment. It should be specific, clear and used sparingly to be meaningful. Teachers not only have to address misconceptions but also to understand why pupils may persist with errors. Knowledge of misconceptions can be invaluable in planning lessons to address errors before they arise 	<ul style="list-style-type: none"> Emphasise the many connections between mathematical facts, procedures, and concepts. Ensure that pupils develop fluent recall of facts. Teach pupils to understand procedures for computations. Teach pupils to consciously choose between mathematical strategies. Build on informal understandings of sharing and proportionality to develop early fraction and division concepts. Teach pupils that fractions and decimals extend the number system beyond whole numbers. Encourage pupils to recognise and use mathematical structure in contexts involving numerical relationships and algebra. 	<ul style="list-style-type: none"> Manipulatives and representations can help pupils engage with mathematical ideas. However, manipulatives and representations are just tools; how they are used is essential. They need to be used purposefully and appropriately to have an impact. There must be a clear rationale for using a particular manipulative or representation to teach a specific mathematical concept. Manipulatives should be temporary; they should act as a 'scaffold' that can be removed once independence is achieved. 	<ul style="list-style-type: none"> If pupils lack the metacognition to work out a solution they need to be drawn on problem-solving strategies to help them make sense of unfamiliar situations. Select problem-solving tasks for which pupils do not have ready-made solutions. Teach them to use and compare different approaches. Show them how to interrogate and use their existing knowledge to solve problems. Encourage them to reason about their choice of strategies. Use worked examples to enable them to analyse the use of different strategies. Require pupils to monitor and reflect on their problem solving. 	<ul style="list-style-type: none"> Encourage pupils to take responsibility for, and play an active role in, their own learning. This requires pupils to develop metacognition – the ability to independently plan, monitor and evaluate their thinking and learning. Initially, teachers may have to model metacognition by describing their own thinking. Provide regular opportunities for pupils to develop metacognition by encouraging them to explain their thinking to themselves and others. But do not be tempted to do too much too early. Positive attitudes are important, but there is scant evidence on the most effective ways to foster them. School leaders should ensure that all staff, including non-teaching staff, encourage enjoyment in maths for all children. 	<ul style="list-style-type: none"> The choice of one particular task or resource over another is less important than the way they are used. Tasks and resources are just tools – they will not be effective if they are used inappropriately by the teacher. Use assessment of pupils' strengths and weaknesses to inform your choice of task. Use tasks to address pupils' misconceptions. Use tasks to build conceptual knowledge in tandem with procedural knowledge. 	<ul style="list-style-type: none"> Selection should be guided by pupil assessment. Interventions should start early, be evidence-based and be carefully planned. Interventions should include explicit and systematic instruction. Even the best-designed intervention will not work if implementation is poor. Pupils have to be helped to understand that interventions are connected to whole-class instruction not separate to it. Interventions should motivate pupils – not bore them or cause them to be anxious. If interventions cause pupils to miss activities they enjoy, or content they need to learn, teachers should ask if they are really necessary. Avoid 'intervention fatigue': interventions do not always need to be time-consuming or intensive to be effective. 	<ul style="list-style-type: none"> There is a large clip in mathematical attainment and attitudes towards maths as children move from primary to secondary school. Primary and secondary schools should develop shared understandings of curriculum, teaching and learning. When pupils arrive in Year 7, secondary teachers should quickly attain a good understanding of their strengths and weaknesses. Structured intervention support may be required for Year 7 pupils who are struggling to make progress. Carefully consider how pupils are allocated to maths classes. Setting is likely to lead to a widening of the attainment gap between disadvantaged pupils and their peers, because the former are more likely to be assigned to lower groups.
VERY EXTENSIVE EXTENSIVE MODERATE LIMITED VERY LIMITED	VERY EXTENSIVE EXTENSIVE MODERATE LIMITED VERY LIMITED	VERY EXTENSIVE EXTENSIVE MODERATE LIMITED VERY LIMITED	VERY EXTENSIVE EXTENSIVE MODERATE LIMITED VERY LIMITED	VERY EXTENSIVE EXTENSIVE MODERATE LIMITED VERY LIMITED	VERY EXTENSIVE EXTENSIVE MODERATE LIMITED VERY LIMITED	VERY EXTENSIVE EXTENSIVE MODERATE LIMITED VERY LIMITED	VERY EXTENSIVE EXTENSIVE MODERATE LIMITED VERY LIMITED

Instinctively, I wanted to approach it as a box ticking exercise and RAG rate our practice against it. Indeed, they provide a broken-down version for this exact purpose. It soon became clear, however, that to do so was to skim over the interwoven fine nuance of the report and it was in here where the real use became clear. To use the over-quoted adage: it was worth more than the sum of its parts.

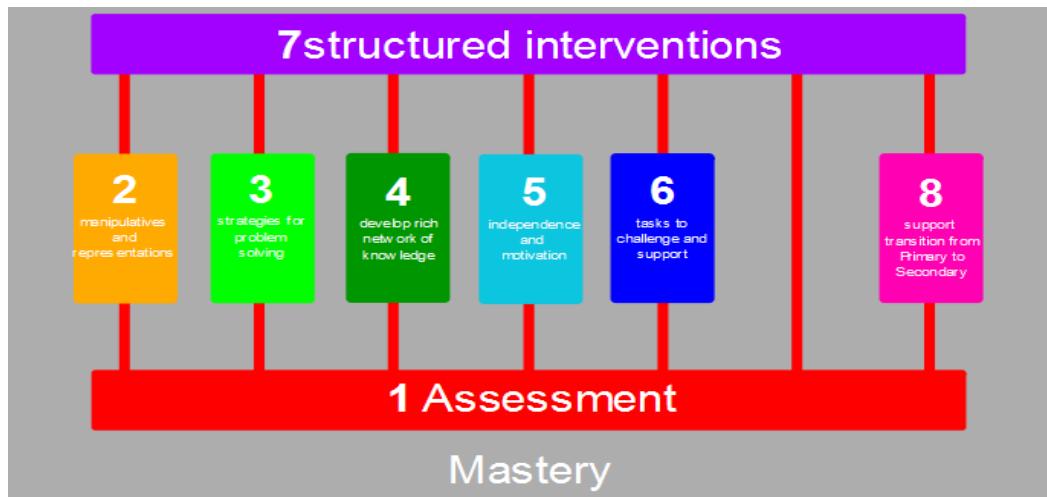
If we take strand **1 Assessment** as our first example: firstly, I agree it should be number 1. But, if we arrange it like the first image below, it reminds us how assessment is the bedrock of everything else

we do. It is continuous and influences what we do before, during and after any tasks, lessons and units of work.

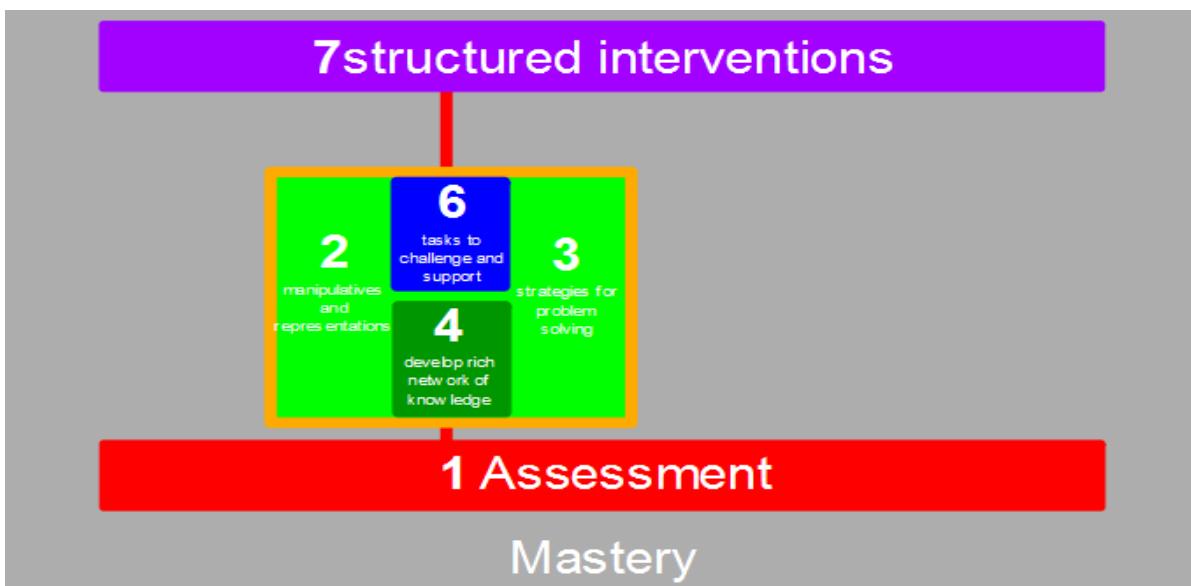


Alongside this underpinning assessment is our reaction to it. This is going to include recommendation **7 Interventions**. In another blog, I am to delve into the details of ‘interventions’ but needless to say they ought to be in response to accurate and timely assessments.

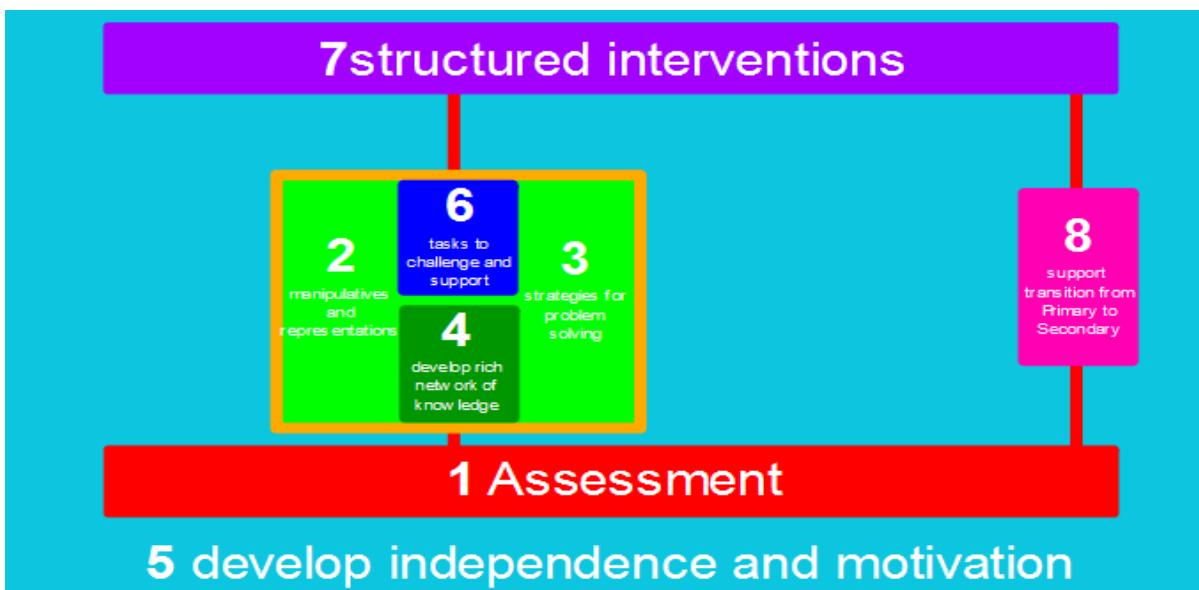
Next, is a matter which isn’t in the report but is blatantly obvious when viewing the report as a whole - the undercurrent of mastery. If we lined up the guidance with what mastery seeks to exemplify, it would tick all the boxes.



Returning to the report itself, what remains are elements which are linked significantly, and which provide such structural interplay that they cannot be evaluated in isolation of each other. Below we see this symbiotic relationship between strand **4 Developing rich network of knowledge** and **6 Tasks to challenge and support**. We toggle naturally between the two; one ineffective without the presence of the other. Furthermore, neither can establish a strong footing without the support of **2 Manipulatives and representations** and **3 Strategies for problem solving**. They almost become the ‘how’ alongside the ‘what’ that strands **4** and **6** provide.



Finally, while **8 Support transition from primary to secondary** remains in place, I see an opportunity to move **5 Develop independence and motivation** to the bedrock position beneath all other elements. The area of motivation is contentious, and one I will hopefully address in the next instalment, but it goes without saying that without a level of motivation and generating independence within children, our best laid plans for maths teaching and learning could be in jeopardy.



This reconsidered interpretation of the guidance fits more with how I believe maths is planned and delivered. Not in a linear scale that finishes one and moves on to the next. Of course, that was never what the EEF have intended for it to be, their report is obviously organised thoughtfully. But when it reaches the classroom, it becomes moulded in ways more akin to the above representations.