

[Thinking Aloud to support mathematical problem solving](#) (EEF blog, 1 February)

EEF Kirstin Mulholland explains how to use 'Think Alouds' to scaffold pupils' problem solving in mathematics.

In the wake of the upheaval of the last two years, many children are finding [mathematical problem solving challenging](#). With the prospect of missed curriculum time, the prospect can seem daunting. And so, where do we start to best support our pupils in successfully tackling tricky mathematical problems?

'Problems' – by their very nature – cannot consistently be solved by an obvious or pre-determined strategy. Instead, pupils need to think flexibly and apply prior learning to the context to select suitable strategies for themselves. For instance, in Y2, children may be asked how many different ways they can put 30 objects into equal groups. They may choose to start off by using a grouping strategy to divide the objects into equal groups of varying sizes to see which can be used to divide 30 exactly and which leave remainders. Alternatively, they could begin with the collection of 30 objects as a whole and then share these equally between a varying number of smaller groups. They could halve the number of objects and then attempt to halve or sub-divide the groups again.

What this demonstrates is that, even with a relatively straight-forward problem solving task, there are a range of possibilities open to children and several choices to be made.

How then can we equip pupils with the knowledge and skills they need, when the very range of problems they may encounter is so varied and unpredictable?

For me, part of the answer lies in teaching pupils specific learning strategies to support them when they are required to independently problem solve. This is reflected in both the EEF [Improving Mathematics at KS2 and KS3](#) and the [Improving Mathematics in EY and KS1](#) guidance reports, which highlight the importance of encouraging pupils to monitor, reflect on, and communicate their reasoning and choice of strategy right from the beginning of their maths-learning journey.

'Think Alouds' to help planning, monitoring and evaluating methods

A [metacognitive strategy](#) which can help with teaching maths problem solving is the **Think Aloud** approach. In a 'Think Aloud', educators narrate their thought processes as they undertake a particular task. This provides pupils with a model which demonstrates how an 'expert' learner approaches a problem, making these invisible processes visible and accessible to pupils.

By modelling the steps we use to determine which approach is needed for any given problem – including the questions we ask ourselves, and how we monitor and evaluate the strategies we use – we can show pupils how they can do this for themselves, scaffolding their independent learning. We can adapt the metacognitive cycle of 'plan, monitor, evaluate' can help to structure this thinking:

### **Plan**

The planning phase of a *Think Aloud* models how you first approach a problem. Modelling how we think through this initial phase of problem solving demonstrates how we develop understanding of problems and identify some of the initial choices which need to be made. This de-mystifies the process and provides concrete strategies which pupils can apply in their own independent learning.

### **Monitor**

Once an approach has been identified, it is important to model how we engage in the problem solving process, including monitoring and reflecting upon the progress we are making. Modelling these reflections for pupils emphasises the importance of continually monitoring our progress as we work, rather than blindly pursuing a pre-determined path.

### **Evaluate**

The 'evaluate' phase can be used once the problem has been completed, to model how we, as 'expert' learners, critically evaluate the strategies we used. Modelling this evaluation process provides an opportunity for pupils to move beyond a single, specific problem, towards reflections that can support their developing understanding of themselves as learners. For instance, this may include helping pupils recognise how useful visual representations (such as bar models) can be when trying to identify the mathematical procedures needed.

It can be useful to plan *Think Alouds* in advance, as many of the strategies we use have become so familiar to us, as 'experts' learners, that they have become automatic. To help us do this, we can ask questions such as those included in the following [tool](#):

By incorporating more frequent opportunities to **Think Aloud** throughout our maths teaching, we – as 'expert' learners – can model effective problem solving approaches, providing a window into our thinking which allows pupils to understand exactly what this looks like.