Alexander (2010) in his report on primary education refers to the need ‘to develop pupils’ increasing sense of responsibility for what and how they learn…to help children to recognise that knowledge is not only transmitted but also negotiated and re-created’ (p.199).

The report also recognises the need for ‘lessons and activities that give children opportunities to take the lead in their learning to enable them to develop a sense of responsibility and self-confidence’ (p.283). One of the report’s guiding principles for improving teaching is that teaching, ‘Promotes the active engagement of the learner’ (p.303), under which heading it includes teaching ‘a repertoire of learning strategies’. How can we meet this in mathematics teaching?

One of several approaches which would help children to develop these attributes is to adopt an investigative style of teaching and learning. Investigations were first given prominence in the Cockcroft Report in 1982, alongside other ways of presenting mathematics. In an investigative approach by the teacher a situation is set where learners have the opportunity to explore the mathematics. Pupils can choose how they go about the task but they must explain what they have done, why they did it that way, and what happened. The teacher acts as a facilitator through adopting a questioning style which focuses the children’s observations. The emphasis is on discovery, but also on the processes of enquiry. This process has to be taught and should become a way of working for children which would support the development of many of the attributes referred to by Alexander.

In an attempt to illustrate this style, here are two examples which compare a traditional to an investigative way of working.

**Example 1**

**Approach 1**

The volume of a cuboid can be found by multiplying length x breadth x height.

Find the volume of the following cuboids.

**Approach 2**

Make a rectangular shape with the multi link cubes. How many cubes are there altogether? How many cubes are there along each side? Make some different rectangular shapes and count the cubes along each side, and altogether. Is there a pattern with these numbers where something similar happens with each of these rectangles? Do you think this happens for all rectangles? What happens when we add some more layers to each rectangle? How many cubes are there now? Can you say whether you think this pattern will happen with other cuboids? Why? Predict an answer and then make the cuboid to see if you are right. Explain to the class what you have discovered.

**Example 2**

**Approach 1**

Today we are going to plot the six-times-table together on the 100 square.

**Approach 2**

Plot the first six answers to the two and three times table on a grid. What do you notice about the answers? Can you predict the next three times they will coincide? Were you right? Can you give a name to this new pattern? Tell me how the 2 and 3 times tables relate to the 6 times table.

Before dismissing this way of working as time consuming in a pressured curriculum and assessment environment, consider whether the learners will remember the mathematics, whether they have progressed beyond the basic objective, and understand the link between area and volume, or the relationship between the 2, 3 and 6 times table, whether they were engaged and curious, and whether they have used the skills and processes of being a real mathematician along the way?

By working in this way the children have had the opportunity to choose how they progress, to seek patterns in the mathematics, to make decisions, to be required to justify their decision making, and to test their assumptions or hypotheses. Also, learners are expected to be able to articulate the process and the results of their work. I suggest this reporting should be about pupils ‘telling everyone’, or ‘someone’ about what they did, explaining why things happen, considering why and whether it works every time and would it work if you changed this particular bit? After all, mathematics is about discovering patterns and relationships and applying...
them to new situations, whether in a creative or a practical way.

And the teachers’ role in this process will be most effective if they prompt and question rather than tell, if they allow enough time for the children to carry out the task, if they make available resources for children to select for themselves, if they hold back for a little while when they can see children heading towards a dead end, but facilitate at an appropriate moment, if they listen to the children and allow children to inform them, if they overtly discuss the strategies used and provide opportunities to investigate mathematics even when key learning objectives must be addressed. It is also important that the processes are discussed and shared with all learners.

This investigative approach is about a style of pupil learning which gives children strategies and process skills which they can apply in other situations, whether it is mathematics, or in other curriculum areas. For the teacher, it is about providing pupils with the opportunity to develop these learning skills, so that they will have the tools to tackle difficulties, the confidence to be more independent, and to engage in the mathematics through opportunities for making choices, making decisions, and providing explanation. In this way children regularly learn to use the processes of mathematical enquiry, to build their strategies, and to consolidate them sufficiently to transfer them to new and different situations.

In addition to taking ownership of the mathematics and their learning, pupils will be establishing a way forward for their future learning in mathematics.

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This article is her personal view.

References


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