making science fun

Forgetting about facts and embracing experimentation is a sure-fire route to successful scientific learning, explains **Adrian Schmit...**

I find the title of this article a little depressing. Twenty years ago, science at primary school was always fun. This was partly because most primary teachers did not have specialist knowledge. Science was all about finding things out. As a non-specialist, the teacher often found things out as well as the pupils. This mutual pursuit of knowledge had an excitement that inspired children and, when they went to secondary school, they were thrilled at the prospect of doing science in a laboratory with proper equipment. After a couple of years, though, many had lost this initial enthusiasm as the joy of discovery was replaced by a barrage of facts and the pursuit of 'right' answers. Sadly, over the years, with the demands of the National Curriculum and SATs, practice in primary schools has drifted towards the secondary model. Many Y7 pupils enter secondary school with the view that science is 'hard' or even 'boring'. Primary teachers may now feel that they don't know enough about the subject and lose inspiration, following standard procedures because it gives them a sense of security that they will be preparing their pupils in the right way.

Science is not a body of facts. It is as much about questions as about answers. It is a process of finding things out. It is useful to know some of the things that others have already found out, because that can inform the process and prevent you from finding out something that is already known. Scientists never do experiments to 'find out' something that is already known – school pupils seem to do little else.

I have yet to meet a child that does not enjoy discovery. If you can allow children to genuinely investigate something neither they nor you know the answer to, they will be inspired.

They will be able to focus on finding an answer, rather than finding the answer they know they are expected to find.

Luckily, the National Curriculum is now moving in this direction, with increasing emphasis on science skills rather than just scientific knowledge. These skills are best learnt through doing genuine experiments, such as the one described below.

The experiment

"Do cut flowers last longer in lemonade than in water?" This was a question I asked a class of pupils several years ago. I explained that it was an old wives tale that may or may not be true. I had no idea, but we were going to find out together. We would have to design an experiment to find out, and that provoked a series of further questions:

Was there any reason why lemonade might be better than water?
The pupils came up with the suggestion that lemonade contains sugar which might feed the cut plants. One knew a little bit about photosynthesis and suggested the carbon dioxide in the lemonade might be beneficial. Clearly, then, the question was reasonable, and worth investigating.

How would we set up the experiment?
Clearly we would have to put some flowers in water and some in lemonade. But how many? One flower in each was not enough, obviously. As a compromise, to avoid me bankrupting the school or myself at the florist, we agreed that three flowers in each liquid for each group (a total of 36 flowers in total) was okay.

How could we measure 'death'?
It was no good just saying a flower had 'not lasted'; we had to be able to measure it in some way. The pupils came up with the suggestion that we should use tulips (which drop their petals) and we would record the time until the last petal dropped.

Did we need to provide an equal amount of water and lemonade for a fair test?
No we didn't (most of the children thought we did). As long as there was enough liquid to keep the stems submerged, the actual amount of liquid would make no difference.

Put it to the test

TRY THESE EXPERIMENTS WITH YOUR CLASS...

- **Why do woodlice always end up in the dark? Do they move away from the light, or just stop moving in the dark?**
- **Does it matter how far apart you plant seeds?**
- **Do taller people have longer fingers?**
- **How does temperature affect the setting time of jelly (or plaster of Paris)?**
- **In cold weather, is it better to wear one pair of thick socks or two pairs of thinner socks?**
- **How does the weight of a toy car affect how far it travels when rolled down a slope?**
- **Does the size of a parachute affect how fast it falls?**
- **Do boys and girls have different food preferences?**

The outcome

We then set up the experiment which lasted about a week. The children religiously checked their flowers every day and recorded when they died (they averaged the times for their three flowers).

Our results were inconclusive – but that didn't matter a bit. In general, the flowers lasted a bit longer in lemonade, but not by much. Two groups found the flowers in water lasted longer. So, our results were not entirely consistent. The evidence for flowers lasting longer in lemonade was not strong enough to be conclusive. If we wanted to be sure, we would have to do a lot more experiments (we didn't).

At the end, I found that I'd discussed experimental design, sample size, significance of difference, variability of results and strength of evidence with a Y6 class of mixed ability – and they'd loved every minute of it, because they were acting like real scientists!

The main danger, then, of the non-specialist teaching science is not so much that they may not be familiar with the facts, but that they think that the facts are all there is to science. Pupils should be given the chance to explore and make sense of their world wherever possible, with their teacher learning alongside them. This does need to be done in a structured and 'scientific' way, and non-scientists may need to develop their own investigative skills. This would be a better focus of training than simply acquiring scientific facts.