SCIENCE SWAP SHOP four-page pull-out

That's the way to do it!

Martin Wesley of Sphere Science provides a few tips on how to improve accuracy in practical techniques, especially for those teachers who perhaps lack confidence in this area. You may well be in a school where there is nothing much wrong with what is being done already, but a few tweaks here and there might improve the outcomes of the activities. In the many different primary schools we have visited over the last 20 years teachers have found these tips helpful.

Using syringes

Syringes can be used for measuring both liquids and gases.

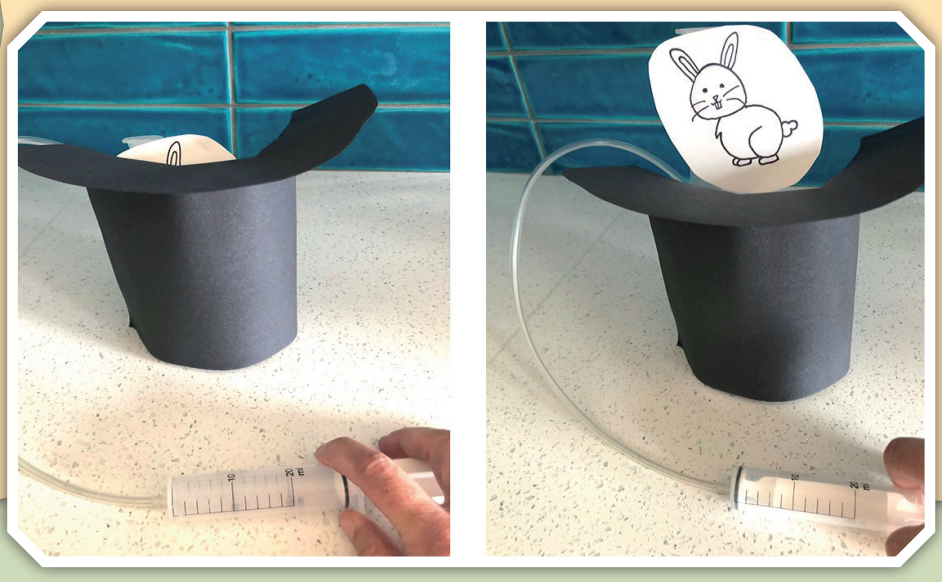
Some tips on how to do it – liquids

- To get an exact quantity of a liquid use a syringe (e.g. 10 cm^3).
- Pull the plunger up until the lower end of the plunger (where it is in contact with the internal surface of the syringe) is on the 10 mark.
- The convex surface of the plunger tip is to allow for the fact that some liquid will remain trapped in the tip when the syringe is emptied.

Some tips on how to do it – gases

As we know, liquids are easily measured this way but gases can also be measured using syringes!

- Fill one syringe with air and link it to an empty syringe with a tube.
- Pushing the plunger of the filled syringe pushes the other plunger outwards.
- This proves that air isn't 'nothing' but is present and could provide the force for a toy, like making a 'rabbit' pop out of a hat.



Extending the learning

Learners can go on to offer some questions that can then be investigated:

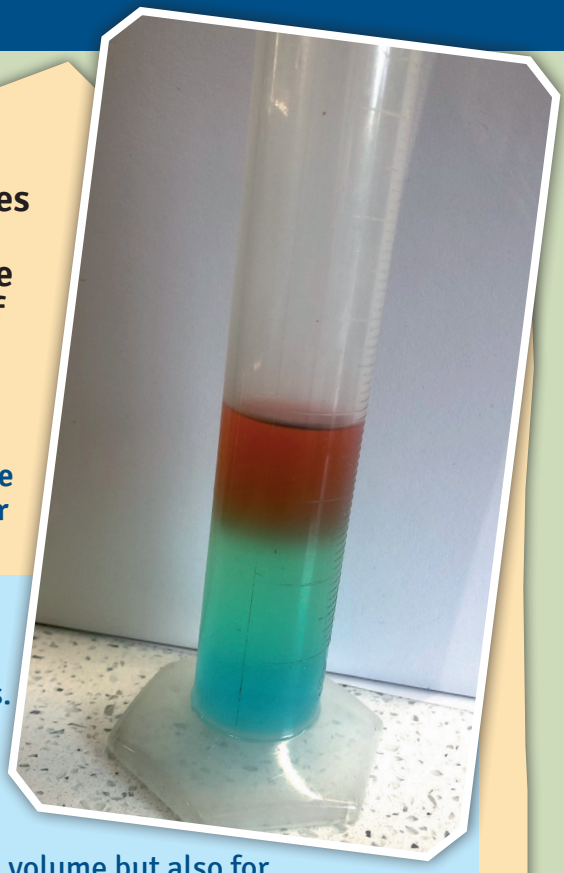
- Is there a relationship between the volume of air in the syringe and how high the rabbit jumps?
- What happens if you push the air out of the syringe faster?
- Can we find something that uses this mechanism in a real-life situation?

SCIENCE SWAP SHOP

Practical techniques

Density layers

When undertaking some activities you might want to have layers forming in solutions, for example when comparing the densities of different concentrations of salt solution.



Some tips on how to do it

- If each solution is coloured differently using food colourings, it is easy to distinguish the different layers.
- I find the easiest way of doing this is to add each liquid very slowly down the side of the cylinder using a syringe (or a cup and pipette depending upon your resources!). The most dense layer goes in first, the least dense last. With some practice you can achieve distinct layers that remain for several days.

Extending the learning

The more concentrated the salt solution, the denser it is. Although we can no longer see the salt, it is still there. This means that the activity is great for developing skills around measuring and volume but also for getting the learners to think, hypothesise and discuss their ideas with justification.

Chromatography

Chromatography is an excellent way for primary school children to observe separations. This is usually done by making a blob with a felt pen in the middle of a round piece of filter paper onto which they drip water.

Some tips on how to do it

These tips should help you to get really great results:

- Make a concentrated, small spot of ink by touching the pen nib several times all in exactly the same place. This makes sure the dispersed colours of the resulting chromatogram are not too faint to see.
- Have the paper on a non-absorbent surface. Ideally, balance the paper on top of a dry cup or a beaker. The wrong surface underneath could absorb both the water and the pigments leaving very little as the chromatogram.
- Add one drop of water at a time (e.g. with a pipette) onto the ink spot, allowing it to soak in completely before adding the next. This will allow a careful separation of the pigments.
- Stop adding water before it has spread out to the edge of the paper. This prevents the solvent running over the edge and taking the pattern with it!

Extending the learning

After using this well-known technique consider what else the children can do. There are many scenarios that set a wonderful context for chromatography studies, such as crime scenes, mystery letters, ransom notes for the kidnapped class toy! What happens if you then use different colours, types of pens, liquids as the solvent, materials for the paper? Letting the children loose with their imaginations and applying the science they have learned helps them develop confidence in their approach.

Investigating circuits

Teachers often talk about finding teaching of electricity really tricky. Part of this comes from its abstract nature but also because the equipment sometimes (often?!) lets us down. Since we cannot see electrons flow around a circuit it is not always possible to see easily why a faulty circuit isn't working. It might be the circuit construction itself or it might be a component.

Some tips on how to do it

http://scienceehs.blogspot.com

- A top tip! To identify a problem, build up the circuit step by step from the simplest possible to the more complicated one that you want. For example, start with one bulb, one wire and one battery – nothing else. After each component is added, you can check that the circuit still works. If not, then the fault clearly lies with whatever was added last and not, as most children instinctively assume, with the battery.

- There is nothing worse, or more time-consuming, than trying to untangle 'crocodile wire spaghetti' when you are in a hurry. As the wires are forever getting tangled up, it is a good idea to line them all up, gently fold them collectively in half and secure with a rubber band.

Extending the learning

Starting with a very simple circuit gives the children fewer items to handle, so they learn how to cope with electrical equipment. If the components are mounted on plastic it makes the manipulation of the items easier but it can also lead to the misconception that plastic is an essential part of a circuit.

Safety: Care must be taken not to create a short circuit by connecting the two ends of the battery directly with the wire.

Racing or testing?

It is more fun to have a race than to carry out a fair test. So, when children (or adults) are asked to compare two similar vehicles, for example, they usually end up having a race. Let them have a race, but consider the results as a context to provide the opportunity to identify potential variables. Afterwards they can carry out their investigation looking at a single variable – making the move from exploration to fair testing.

Some tips on how to do it

- **The significance of the floor surface is often overlooked, although the experimenters are good at deciding the other variables that need to be kept constant! In the playground, for example, two vehicles racing along side by side are not travelling on exactly the same surface because there might be lumps or cracks.**
- **It is fairer if they mark out a test area and then let the vehicles travel one at a time on exactly the same surface.**

Extending the learning

This can be used as a key discussion point about the challenges of 'fairness' and how easy (or difficult!) it is to control something completely to eliminate all extraneous factors.

Martin Wesley is one of the three working directors of Sphere Science (since the company was formed in 2000) and has run workshops in several hundred schools across the UK, practical science courses in many universities, CPD and INSET courses for teachers and family events for the public. For further information:
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