Science For All Case Study

The Use of Cameras in Special Needs Science Education

Patrick Organ and Barbara Watson, The Forest School, Knaresborough

Background

A major issue when teaching pupils with severe and moderate learning difficulties is that of assessment and recording. It is quite likely that much of the evidence of pupil achievement and progress will be ephemeral.

It was to help deal with this particular problem that we originally started to use the digital camera freely in lessons. It soon became clear, however, that we had a tool which could enhance the teaching and learning in many different ways.

These can be summarised under the following headings:

- Catching the moment
- How else would you see it?
- Starters and plenaries
- Sequencing
- Pupil centred reviews
- Communicating

This list is not intended to be exhaustive, and some of the other possible uses are discussed at the end of this document.

Catching the moment

How many times have you thought: “If only I had a camera…”.

Many of the pupils’ experiences are transitory and, without anything to remind them, soon forgotten. Having a camera to hand all the time means that these moments are not missed.

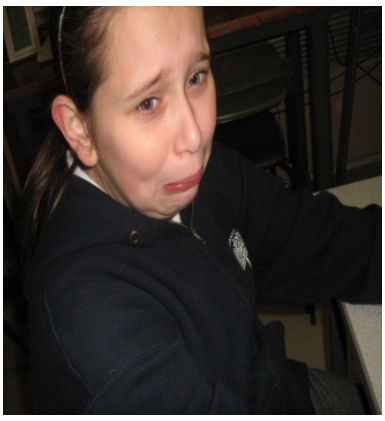
This example shows a pupil with a “rainbow” in their hands.

The Science Lab has a fish tank and gecko vivarium near an east facing window. One particular bright October morning pupils were sat around the animals waiting to feed them. I noticed that one child was staring into their hands at a vivid spectrum. It was caused by the sunlight being dispersed as it passed through the corner of the fish tank, then being reflected off the front of the gecko vivarium and onto the child’s hand.

The pupil was sat, staring in fascination at this “magical” phenomenon. All the children were then encouraged to sit in the special seat to have their picture taken “holding” the rainbow. Over the next few weeks, whilst the angle of the morning sun was just right, pupils throughout the school were given the opportunity to experience it. This even prompted an early years child, who hitherto had always painted simple monochrome shapes, to return to class and paint a rainbow – a major breakthrough!

Sometimes it is the pupil’s reaction you want to capture.

In an introductory lesson on acids, pupils were given slices of lemon (and other things) to taste. Clearly the pupil in this picture has shown some appreciation that the lemon tastes sour!



The change in expression is often important. These images show a pupil experiencing the effect of turning on an electric motor.

And it was this experience that encouraged him to have a go at switching it on himself, using two strips of copper as a switch.

Whatever the pupil experience is, recording it means that it can be enhanced in many ways.

How else would you see it?

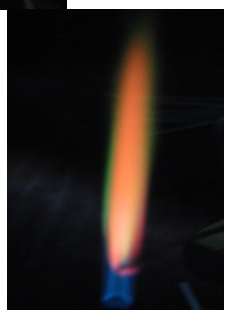
Sometimes a camera is an integral part of the demonstration or experiment.

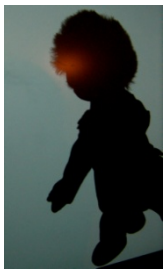
Many schools require their pupils to wear yellow bibs when walking off site, particularly during the winter months. To what extent do the pupils know why? Even those who have some idea about reflection are unlikely to know that it is the dull grey stripes that make the real difference.

To demonstrate why the bibs are worn, pupils were photographed in dark conditions with and without the flash.

These pictures were so popular when they were displayed that many pupils in other classes wanted to experience it for themselves.

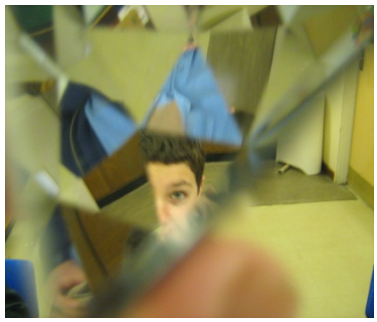
Whether it is flame tests, shadows or UV paint, using the camera allows the pupil to make comparisons and see differences. This is something that it is often very difficult to do in real-time.





Optical effects can also be recorded so that they can be shown more clearly or discussed later.

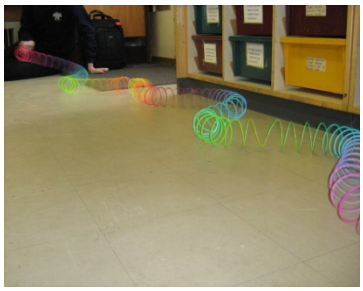
The first photograph was produced by putting a pupil-made kaleidoscope (just three rectangular mirrors formed into a triangular prism) in front of the lens.



Similarly, interesting effects can be produced by getting the pupils to hold a magnifying lens in front of their face.

No series of lessons on reflection can be complete without a demonstration of “Pepper’s Ghost”. It is notoriously difficult to see what is going on, however. This picture was taken by one of the pupils. It could be further enhanced by showing what it looks like on the other side of the glass.

The camera can also help overcome misleading analogies. A slinky is commonly used to demonstrate some of the properties of waves. A transverse wave can be shown by moving one end of the slinky horizontally whilst it is stretched on the floor. The amplitude of the wave is then often referred to as the height (from the average position). Some pupils find the idea of a horizontal height quite difficult. Taking a picture, however, not only captures the wave motion, but also allows the wave to be “tipped up” so that the horizontal displacement can look like a height.



Starters and plenaries

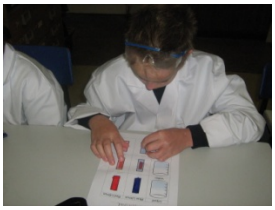
Many classrooms have dedicated computers operating an interactive whiteboard. If the USB camera lead is left plugged in, it is a matter of a minute or two to transfer the pictures onto the computer so that they can be used to summarise the lesson, and to prompt pupil responses about what they have learned.

The pupils usually enjoy seeing pictures of themselves, and seeing an aspect of the lesson again helps them remember it.

An example of this comes from a lesson on acids, bases and the use of litmus paper as a test. The pupils were given a mystery to solve. A bag of mini eggs had gone missing, and some liquid had been discovered in their place. Four members of staff had been seen with a little container of liquid, and had been in the lab that morning. The pupils' task was to identify the liquid and then test the teachers' containers to see if any matched. The guilty teacher was then brought in to explain themselves. Photographs were taken throughout the lesson so that, at the end, the process could be emphasised – otherwise too many pupils would only be interested in the outcome, especially as they were given an egg each.

This is a sample of the many photographs taken:





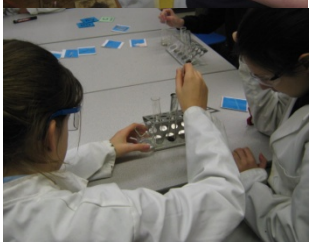
Having a set of photographs from the previous lesson also allows the pupils to be reminded of what they were doing. This is very useful if the lessons are part of a scheme covering one topic.

Sequencing

Many experiments, particularly in chemistry, require several steps to be carried out in a particular order. To help enhance the pupils' learning, a visual record of the pupils carrying out those steps can be arrayed randomly, and the pupils asked to put them in the correct order.

A good example of this is the extraction of copper from copper carbonate.



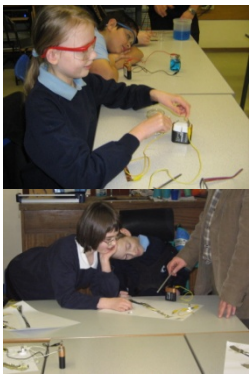
The green copper carbonate is put in a testube. It is heated and it turns black (copper oxide) and the powder bubbles (carbon dioxide is driven off). This is thermal decomposition. It is left to cool, and sulphuric acid is added (neutralisation). It turns blue (copper sulphate solution). An iron nail is placed in the solution and it turns red/brown (displacement reaction). The pieces of copper can then be scraped off.

As can be seen, there is a lot of chemistry in this procedure. Anything that helps break it down into a logical sequence can only make it easier to follow and understand.

Pupil-centred reviews

As stated at the beginning, the original idea to use the camera more frequently came about because of a need to record achievement. Pupils who find it difficult to write down, or even recall their experiences rely on the recollection of the adults in the class. When the pupil's work is reviewed, the outcomes can then be very one-sided and incomplete.

The photographs can be used to make during pupil reviews to show what the pupil can achieve, and to encourage pupils to talk about their work.

Communication.

There are many different activities in any lesson, some of which are intentional, but many which come about by chance. An important aspect of almost any lesson is the time the pupils spend talking to each other. Often these interactions are positive, and capturing them is important because they are not teacher led.

To encourage communication skills even further, the pupils can be asked to describe what they were talking about later.

What else?

Raising Self Esteem

Have a display of "What we did in Science Last week". The pupils will enjoy seeing themselves, they will be reminded of what they did, and the teacher will show that they value the work of the pupils. All of this will go some way to raise the self esteem of pupils.

Modelling good behaviour

A good role model for poor behaving pupils can be themselves. Capture the pupils doing something good, and display it. Pupils with behavioural difficulties will be reminded that they can behave well and achieve positive outcomes.

Exam revision

Any stimulus that aids recall will be useful when revising, and if the pictures can be turned into an exercise, such as sequencing, then so much the better.

Showing parents and other professional what the pupil can do.

Some parents can have a low expectation of their child's ability. Some parents hold their children back by doing too much for them. Having photographs of a confident child achieving positive outcomes can be very informative for some parents.

Social stories.

Sometimes a child can be encouraged to make progress with social stories. Having a bank of photographs involving that child makes it easier to produce pictorial reinforcement of the message in the story.

Conclusion and practical tips

Photographs clearly enhance the experience of the pupil in many ways. It works best if it is well organised.

- Label the camera so that other staff don't "borrow it" – make it clear that you use it every lesson.
- Always have a spare set of batteries on charge and ready to use.
- Organise the files so that it is easy to find the photographs when needed.
- Upload the photographs as soon as possible – have a lead permanently plugged into the computer. Delete the pictures from the camera once they are uploaded.
- Get into the habit of taking the photos – perhaps let a TA do it.
- Have a shared area for everyone's photos, with sufficient storage space.