Jon Allen, teaching and learning adviser at Promethean, offers some valuable tips for using an interactive whiteboard in science teaching.

Increasing the velocity of **science learning**

Outside of school, pupils live in a very different world to the one that they would have known even ten years ago. A pupil's bedroom may contain half a dozen or more digital devices for communication and entertainment. CD players, DVD, digital TV, mobile phones, Playstations and computers all combine to give a sense of 'bite-sized' engagement with the world, but with access to a huge range of resource and entertainment. It can be hard for the classroom environment to compete with this kind of engagement and it is crucial for teachers to have tools to excite and engage pupils and drive interest in certain subjects.

At the same time, the number of pupils opting for science courses at A-level and universities is dwindling. It is therefore more important now than it has ever been to encourage pupils to get involved and interested in science.

The fear here is that text book images no longer inspire pupils. Arguably, it is too far removed from the way they interact and absorb information outside of the classroom. For example, pupils often find it hard to visualise concepts such as Newton's Laws, or the way that blood is pumped around the heart, unless they can see these things demonstrated.

With topics where time and cost restrict the frequency of 'hands-on' demonstrations, it can be tricky for the classroom to compete with the level of engagement offered outside of school. However, technology in the classroom, such as interactive whiteboards, can help to redress the balance by allowing teachers and pupils to actively control images and text, creating a compelling fascination that maintains pupil concentration for longer periods than 'chalk and talk'.

That's the hypothesis, now here's the science ...

Flipcharts

By using flipcharts on an interactive whiteboard, a teacher can arrange the steps for an experiment in individual boxes. The objects can then be arranged in random order within the flipchart and can be dragged into order by pupils to reinforce the topic, as well as prompting class discussion around the steps of the experiment.

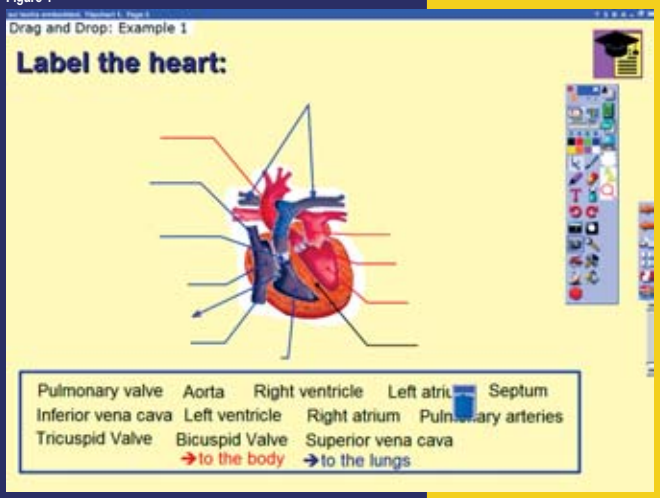
The flipcharts, created within the interactive whiteboard software, are digital representations of text and images that can contain numerous pages. Each chart can be created in advance, adapted for different classes, re-loaded to review topics and saved with user notes so that they can be easily used and adopted by other teachers.

In Figure 1, the page is set up so that pupils can drag the labels to the appropriate arrow, thus encouraging class interaction as well as trial and error techniques.

This type of technology can be used to illustrate situations which could not always be feasibly demonstrated. Drawing on resources such as the Internet (which is instantly accessible while in your flipchart pages) enables images from the Web to be incorporated into a lesson. By building in hyperlinks in advance, anything from flash animation sequences, digital video clips to recorded speech can be brought into the presentation, maintaining the pace of a lesson as resources are instantly available.

In Figure 2, an image of a nuclear power station, accessed via the Internet (www.ida.liu.se/~her/npp/demo.html), can be 'controlled' to show hazards involved in the given situation, while the teacher is able to annotate over the image if required. This gives pupils a clear understanding of a topic and allows the teacher the freedom to change direction of the lesson and alter resources without any need for 'graffiti-ing' on physical resources.

Figure 1



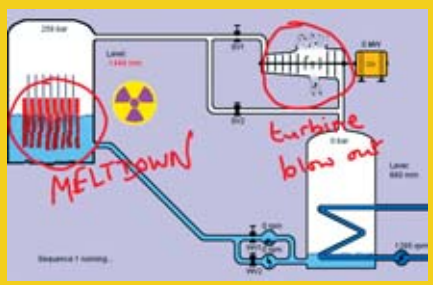


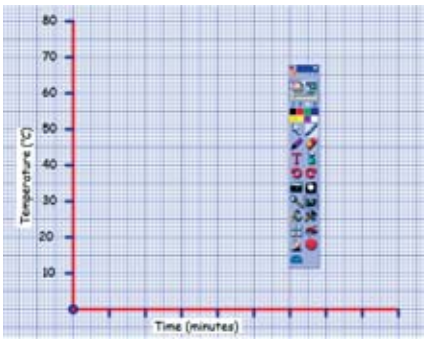
Figure 2

No confusion

'Rub out and reveal' exercises also work well. If we take an image of a blast furnace, the naming labels can be masked by coloured ink. Pupils can then be orally tested on their knowledge of the correct labelling and the masks are rubbed off to reveal the correct answers. This ensures that all pupils can read what the outcomes are, leaving no confusion if a student misunderstands certain elements of the lesson.

For visual learners, these kinds of flipcharts use a rich variety of colour and multimedia resources, not only gaining pupil attention but also holding onto it. Teachers can develop personalised flipchart backgrounds, which can then be saved and applied to any series of flipcharts created. For instance, graph paper (Figure 3) can be loaded from the existing resource library and the axes can be drawn and labelled (precluding the need to repeatedly redraw axes), introducing new resources to the lesson.

Figure 3



For kinaesthetic learners, the ability to drag and drop images and text can reinforce the learning process. For auditory learners, the use of other voices (even those of the pupils themselves) can stimulate learning.

Other equipment

A digital video camera can be used to record an experiment so that it can be played back within a window on the whiteboard and further discussed and annotated (Figure 4). This saves time and resources and ensures that all pupils know the process of the experiment.

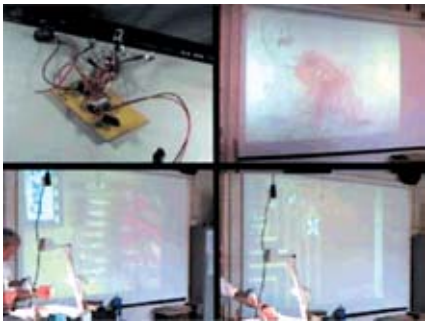


Figure 4

Incorporating other digital equipment such as electronic microscopes, cameras and scanners further enhances the capabilities of the board. In this example, the teacher employs the use of a digital visualiser to demonstrate a circuit board. The ability to zoom in on the wires and circuit board means that students do not have to crowd around a bench, with some unable to see the action. And using the whiteboard, the teacher can annotate over the images to further emphasise points.

With well-designed flipcharts, teachers can enhance the pace and style of lessons. If a seamless set of resources can be incorporated as the main delivery medium for the lesson and interacted with in a variety of ways, pupils will view the delivery as 'neat, cool and sophisticated'.

Whole class

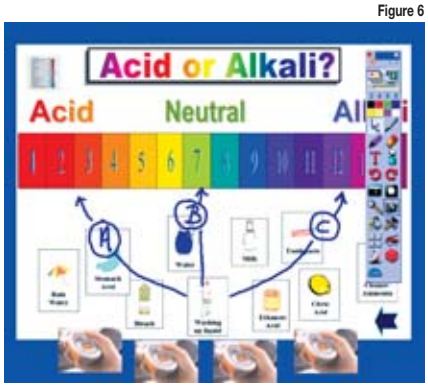
Over time, as the use of interactive whiteboards becomes embedded in lessons, the whole class involvement becomes paramount. In Figure 5, Promethean's wireless tablets are being used by pupils as well as the teacher. This allows individual pupils to take control of the board without leaving their seats.

Figure 5

The use of response devices, or voting pods (to the left of the tablet shown here) throughout a lesson is also an engaging and stimulating way of teaching. The teacher can simply ask the whole class to 'vote' on whether they agree or not. With the entire class participating, the teacher can immediately see who is actively engaged and whether they understand the subject matter. Responses become more of a shared activity and all pupils are involved in the lesson and feel their response is valued.

In Figure 6, the teacher has turned to a flipchart page showing the pH scale and various household substances. The teacher asks the pupils where they think washing-up liquid would appear on the pH scale and then uses the annotation pen to give them three choices. The pupils use their voting devices to express an opinion and this involves the whole class in making a decision without having to reveal their answer, avoiding embarrassment if they are wrong. The teacher now reveals their opinions as a bar chart and can discuss why perhaps most opted for pH 7 (and also revealing that the answer is at the alkaline end of the scale).

Figure 6



Because a summary of the class response, not individual answers, is displayed on the board, collaboration is enhanced as the focus of attention is shifted from teacher to students and the board. These devices are also successful at eliciting a response from more disaffected pupils, encouraging those for whom science may not be their strongest subject.

■ Jon Allen joined Promethean seven years ago after spending 20 years as a teacher. Inspired by the first interactive whiteboards at BETT 1998, Jon now enjoys working closely with a network of schools in the South West to develop their ACTIVboard usage.

Information

As a leading supplier of interactive whiteboards, Promethean is dedicated to providing its customers with ongoing training and support. The majority of Promethean's customer facing staff come from a teaching background, actively promoting best practice of its own range of ACTIVboard interactive whiteboards.
You can download a guide for secondary or primary teaching on getting the most from your interactive whiteboard at: http://publications.teachernet.gov.uk. For more information about using interactive whiteboards in science visit: www.thereviewproject.org. Or download pre-prepared flipcharts: www.prometheanworld.com
Promethean will be exhibiting on Stands W19, W40 and V60 at BETT 2006.