'In real life, science doesn't work as well'

By striking a balance between practical and software-based testing in class, primary teachers are bringing the subject to life without having to spend hours setting up experiments. Heather McLean reports

Amid busy chatter, heated debate and furrowed brows, eight-year-olds in Vanessa Baker's class struggle to decide which of the objects on their desks are either electrical insulators or conductors. The pupils at Valley primary school in Bromley have just been taking it in turns to run up to the interactive whiteboard to drag and drop different components of an electrical circuit into place, using a simulation from Virtual Experiments. Now they are working in groups to decide practically how to group various objects, including paper and metal forks.

Ceyda walks up to the interactive whiteboard and hesitates while deciding into which group she should place a metal coat hanger. She begins to drag it to the insulators circle, but the urgent whispers of "no!" from her peers guide her to the conductor circle. After the class have dragged all the objects on the screen to their correct circle, they return to the practical experiment. They place each object on their tables and insert them into a mini circuit to see if a lightbulb will glow, to test the conclusions drawn on the interactive whiteboard.

Baker explains why she likes to mix practical and software-based testing in class: "If you want pupils to draw results, interpret what they've seen and draw conclusions, virtual experiments are the best thing to use as they speed things up. You can repeat tests and change variables, which you can't do in a normal class, to consolidate learning."

Many primary schools use simulation experiments. The BBC Science Clips website provides Andrew Trythall, year 1 teacher and ICT coordinator at Sir Robert Hitcham's primary school in Framlingham, Suffolk, with science simulation experiments he uses before or at the end of a topic. This means his students can run tests and compare models to real life situations. "In real life, science doesn't work as well as it does in these models," says Trythall.

"My year 1 group have just done a topic on toys, so we used a BBC Science Clip called Pushes and Pulls. In the classroom we've experimented with pushing and pulling forces on real toys, and on the PC we've looked at a wooden toy horse on wheels that you can push and pull in different ways. For younger children, the software reads out the questions and answers. It's excellent as a plenary."

Judith Barber, science coordinator for key stage 2 at St Philip Neri Roman Catholic primary school in Sydenham, London, uses the Planet Science

website's Flesh Eaters program. Barber uses this software to top and tail a practical experiment. First students are taken underground by two people. In a cave, one character has the flesh eaten from his face. The students drag and click to get evidence from the scene, then go to a lab in the program to get the test results.

Identifying the culprit

The conclusion is either that the slime or the cave water has eaten the character's face, so the students have to decide on the culprit. In practical experiments in class using raspberry jelly and milk for flesh, the pupils find out through overnight tests that the room temperature cave water is the flesh eater. They then go back online to present their results and save the day.

Granada Learning's Simulation Explorer won the 2006 Bett award for science at key stages 1 and 2. One of the teachers that helped develop it in the classroom is Julie Yaxley. She got children learning through an alien plant simulation, where students changed the soil and spoke to the plant to see what made it grow, what colour the flower went, and to learn about fair testing through their ability to change only one variable at a time.

Yet not all teachers are initially interested in simulation experiments. One of them was Carol Oliver, deputy head and science coordinator at Kenmont primary school in Hammersmith, before she was quickly won over by BBC Jam's skateboarding cow. This allows students to practice pushing a cow on a skateboard with different levels of force, differing the variables one at a time. BBC Jam was trialled with years 3 and 4 at the school. Oliver's pupils tried a hands-on experiment first, then tested out more theories with the cow and its skateboard. "The kids liked the content as it's very attractive and clear for them to understand, but it's also very clear scientifically."

Software that aids learning includes RM's interactive Easiteach. To learn how the skeleton moves and stays in one piece, children in year 6 at Powell's Church of England primary school in Cirencester, Gloucestershire, used the software on the class whiteboard. They watched a clip of how the skeleton, joints and muscles move together, zooming in on specific areas of interest. Then students come up one at a time under the direction of Sam Bartholomew, senior leadership teacher and ICT coordinator, to click on different things to see and learn more.

To round off the lesson and the learning, Bartholomew's students took part in an online quiz about the skeleton from the Primary Resources website. Bartholomew supports use of web content and software that gets kids interacting with their peers in science: "This type of group work enables children to hear each other's ideas and theories and learn from each other."

Online surveys are another form of web content that schools are using. They have become an important aspect of science teaching at Lickhill Lodge first school in Stourport on Severn, Worcestershire, where students take part in the RSPB's garden bird watch, logging birds seen in their back gardens on

survey sheets and feeding that data back online. They are also involved in the Springwatch Survey 2006 from the BBC website. Headteacher Calne Edginton-White says: "These resources encourage children to become scientists very early on by engaging them in community science programmes."

Hardware that comes with high quality software is also opening up science in primary schools. Sir Robert Hitcham's Andrew Trythall uses software on the popular Easy Sense Data Logger from Data Harvest to set his students loose around the school. The children have taken readings on temperature, light and sound from their surroundings using the Data Logger kit, which takes a reading every second. This is downloaded on to a PC where the software converts it into one or all of several types of graph for comparison and analysis.

Intel's Microscopes are also common in primary schools. The software provided allows still pictures and clips to be made on the microscope, then transferred to a PC or interactive whiteboard for whole-class participation and use with relevant web content. Sam Bartholomew has used the microscope to create time delay films of a seed germinating under the microscope for use on the interactive whiteboard. After taking a picture of the seed every 24 hours, the clips are run together on the whiteboard and the germination happens live in front of the students.

One trend noted by several teachers is the onus on more things moving to the web. Schools used to pay large sums for licences; now classroom resources are becoming easier for teachers to afford and access. Another trend called for by Andrew Trythall is to develop more generic tools for science. "Everything's about content. We're stuffing content into students and teachers but that isn't what science is about; it's about developing an enquiring mind. We need more tools that enable access to content."

Weblinks

Virtual Experiments:
www.collinseducation.com/autosites

Primary Resources:
www.primaryresources.co.uk

Granada Learning Simulation Explorer:
www.software.granada-learning.com

BBC Science Clips:
www.bbc.co.uk/schools/scienceclips

BBC Revisewise:
www.bbc.co.uk/schools/revisewise

BBC Science and Nature:
www.bbc.co.uk/sn

Virtual Solar System:
www.solarsystem.org.uk/planet10

Planet Science Under 11s:
www.planet-science.com/under11s

Birchfield Interactive Lesson Kits:
www.birchfieldinteractive.com

Plato Learning Multimedia Science School:
www.platolearning.co.uk

Buried bones and cauliflower brains

Two years ago Emma Barber, deputy head of science at Langley Park boys school in Bromley, London, developed a practical, delightfully gory experiment called Digging Up the Past. Buried bones were excavated by students, labelled and measured to find out the victim's gender and age, then more tests were run on the victim's last meal - soup became a stomach contents substitute, cauliflower was used for brain, and oil and food colouring doubled up as blood.

Digging Up the Past has been renamed CSI Bromley and is now on the national grid for learning's website, as are all the other resources developed by Barber. These include still photos for schools unable to replicate the procedures themselves. Barber has been working with local primary schools to provide accessibility to this resource: "It's about thinking outside the box, not just scientific skills, so all levels of primary school students can use it."

Nigel Bispham, director of science at Camborne science and community college, uses Data Harvest's Data Logger on pocket PDAs, named Flash Logger. A software card slots into the top of the PDA to give students instant access to information including instant graphs on the move. "This software encourages more of a risk culture," says Bispham. "It's empowering pupils to think their way through an experiment and make it work."

Bispham has worked with Data Logger to develop 3D ultrasound for classrooms using a motion sensor on Flash Logger with KS4 groups: "I get a big cardboard box, put a sheet over it and place a composite object inside the box. The kids work to an 8x8 grid, taking 64 readings. That data is put into Excel which creates a 3D bar chart that you can drag and drop to rotate it, effectively drawing an image of what's in the box. It's fantastic; you can't yet get 3D ultrasound images in most UK hospitals."

At Wootton Bassett secondary school, near Swindon, KS3-4 pupils are using Birchfield Interactive's Lesson Kits. Tony Forsythe, head of science, says by using Lesson Builder he can allow students to build their own lessons. They

do this by using Google to search inside Lesson Builder for everything on a specific subject then, using drag and drop, following the inbuilt lesson style, or adding their own filmed content to their lesson sequence.

Neil Dixon, a science teacher at South Bromsgrove high school technical college, uses the latest version of Multimedia Science School from Plato Learning. Its collection of teaching tools lets teachers demonstrate more abstract areas of science syllabuses not possible to show in the classroom to help understanding of a concept. With year 11, Dixon is teaching the Haber Process, a way of producing ammonia. While the industrial process takes place at 200 times the atmospheric pressure, making it impossible to replicate practically in school, the software simulation lets students change pressure and temperature to see how these variables affect the yield of the reaction.