



REACHING OUT TO PRIMARY SCHOOLS: THE BRISTOL CHEMLABS EXPERIENCE

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DESCRIBE A CHEMISTRY 'LIFELINE' FOR
PRIMARY TEACHERS AND CHILDREN

Successful science outreach

Local universities and other higher education establishments represent a huge potential resource for primary schools that is often untapped. The School of Chemistry at Bristol University has recently become a Centre for Excellence in Teaching and Learning (CETL), the only one in the country in chemistry. Our project, known as Bristol ChemLabS, will centre on new approaches to practical chemistry and also involves an increase in outreach activity.

Over the last five years the university has been running a number of pilot schemes in general science with High Down Infants School in Portishead, Somerset, and other local primary schools. Since the award of the CETL in April 2005 these activities are being gradually rolled out to other primary schools in the area. In this article we highlight the range of activities that have been undertaken and give an indication of their success. No matter where your school is located, if you are interested in any of the projects



Figure 1 (left) **Children investigate changes in properties of slime at a science week workshop**

Figure 2 (top) **Creating strong structures from spaghetti and marshmallows with the assistance of a Science and Engineering Ambassador**

Figure 3 (below) **Children are provided with protective clothing so that they feel like 'real scientists'**



mentioned please contact ChemLabS at the email address given at the end of this article.

Science weeks

In 2003 High Down Infants School started holding a 'science week' in the autumn term. Each year a theme or book is adopted on which the science for the week is based. In 2003, the book *The lighthouse keeper's lunch* (R. and D. Armitage, Scholastic Hippo), led to year 2 pupils (6/7-year-olds) building lighthouses with working electrical circuits and light-bulbs; year 1 (5/6-year-olds)

looked at pulleys, and all years were able to look at diet in the context of Mr Grinling's lunch. History and geography had a lighthouse theme and there was a science workshop on the Thursday evening, where the work from the week was exhibited. The

workshop attracted a very large number of parents and carers, who were able to work through a circus of experiments. In 2004 the science week used the story of the three little pigs as a basis for an investigation into materials: highly appropriate, as major

building work was taking place at the school! In 2005 *Hue boy* (R.P Mitchell, Orion) and *Titch* (P. Hutchins, Random House) were used in a week focusing on healthy living. ChemLabS participated in all three science weeks, running science workshops for the children and providing resources for the activities.

The **good things** we found about running a science week were:

- The science week theme permeates all strands of teaching and sends out a strong message to the children. They know what the week is about.

- There is continuity for the children.

- Staff and children are able to immerse themselves in the topic, generating enthusiasm.

- There are lots of opportunities for 'hands-on' activities.

- It involves parents, carers and other family members who have been very keen to participate in science weeks.

- The children have an opportunity to access a wide range of experiences and activities.

- Teachers acquire new resources for the children and can explore them fully.

- The children have enjoyed working with 'real scientists' from outside the school and feel that their investigations are valued.

The **drawbacks** we have found in running a science week include:

- It takes a lot of organising, especially to bring in visitors from outside to support the theme.

- Funds have to be raised for subsequent visits to places of relevance to the theme.

Overall, these weeks have been a great success and, for what it is worth, Ofsted thinks so too. The partnerships forged between pilot primary schools and Bristol

ChemLabS have allowed us to overcome the potential drawbacks quite easily.

'Ambassadors' as role models

Through funds for outreach from ChemLabS we have trained postgraduate science 'ambassadors' (students who have a first degree and are typically in their early 20s) who go into local primary schools and run science workshops on a variety of themes such as colours, light, energy, materials, time, food and many more. The Science and Engineering Ambassadors (SEAs) are trained in the roles and the responsibilities of both the ambassadors themselves and those of the teachers they are working with. At ChemLabS we have 80 trained SEAs at present with yet more undergoing the course later in the year. Using young postgraduate scientists as role models is a big boost to promoting science, particularly the participation of female SEAs who have broken down the male stereotyping of physical scientists present in at least one school.

As part of a primary science week, Bristol ChemLabS is often asked to contribute science workshops for the older children. For these, the SEAs run a circus of three 30-minute physical science experiments. Activities used in 2005/6 include:

- Investigating the change in properties of slime when different proportions of borax and PVA are used. This is very popular with children (Figure 1).

- An iodine clock experiment where investigation of dilution, accuracy in volume measurement and fair-testing are necessary to make the chemical reaction change colour at exactly 30 seconds. This is run as a competition.

- Investigating the effect of diluting an acid on its reaction with magnesium.

- Investigating the effect of altering aspects of paper

helicopters on time of flight.

- Creating strong structures from spaghetti and marshmallows (tested to destruction by loading with marbles) (Figure 2).

Bristol ChemLabS provides all the equipment and chemicals required for these workshops. To add to the experience, as well as fulfilling the risk assessments for some of the activities, the pupils are provided with white lab coats, safety specs and, where necessary, disposable rubber gloves (Figure 3).

Explosions, freezing and froth

We have also developed a number of demonstrations that can be used as one-offs in a full school assembly. Examples include controlled explosions of hydrogen balloons, the use of liquid nitrogen at least 220 °C below room temperature (Figure 4), dry ice (solid carbon dioxide) and the making of oxygen froth. The demonstration assemblies are currently being performed by our school teacher fellow, but plans are underway to train the SEAs to do some of these.

The 'wow!' factor created by these activities and demonstrations and the longevity of their impact are impressive. An investigation into the different colours of Smarties® using filter paper or exploding balloons is still talked about months afterwards.

New projects

Four new projects that ChemLabS has launched in 2005/6 across the region for primary schools are:

- **Chem@rt:** A collection of 16 images on topics such as materials and the environment, derived from research in the School of Chemistry, have been sent out to nearly 50 schools, together with some accompanying notes. Each school has been invited to display the images and run a

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poetry/prose-writing competition within the school. Some of the early entries have been outstanding and teachers have been using the images to stimulate science investigation.

■ **Minute challenge:** Can you time a minute without using a conventional timing device? Twelve primary schools have taken up the challenge: they have two terms to perfect their method. No clues have been provided with the challenge. At

answers to questions based on key stage 2 (7–11 year-olds) science, using information on dictated websites, and is now running for participating schools in the Bristol area.

■ **Grätzel (solar) cells:** Grätzel cells are photocells that convert sunlight directly to electrical energy. These simple cells are unusual in that they use fruit dyes such as blackberry, raspberry or even blackcurrant cordial to operate. Work is underway to make this piece of 'green chemistry' available in a form that can easily be understood by key stage 2 children. The beauty of this new development is that it is possible to develop investigations that can be undertaken with limited laboratory equipment and low-hazard chemicals. The cells are made from two pieces of specially coated glass, each of which conducts on one side. The cells are connected up in series and left in the sun (or in winter under a lamp) to produce sufficient current to power an adapted calculator or a small motor. With access to a multimeter and/or a light meter a number of investigations can be looked into.

All children participating in the first three activities listed above will be given at least a certificate from the School of Chemistry, University of Bristol, and prizes will be awarded. It is hoped to roll out these projects regionally or nationally in the near future.

University-school links: an untapped potential?

University science departments have a lot of resources that primary schools could use. Whilst there is always a cost implication (financial or time), in our experience building up a relationship between the university and a few local primary schools has had huge benefits for both parties. University postgraduates have had the opportunity to design, plan and implement public engage-

ment in science activities, whilst primary schools have been introduced to new resources and role models. The university – primary school link is rarely discussed and, although Bristol is certainly not unique in forging such partnerships, their potential remains largely untapped. We are mindful of the notion of sustainability and have built up slowly and sustainably over the last five years. If you are interested in any of the projects mentioned, please contact ChemLabS at the email address below.

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Websites

Bristol ChemLabS project: <http://www.chemlabs.bristol.ac.uk/overview.htm>
 Grätzel cells: <http://www.azom.com/details.asp?ArticleID=2210>
 Recent outreach with The School of Chemistry, University of Bristol: http://www.chm.bris.ac.uk/schools/recent_events.html
 SEAs: <http://www.setnet.org.uk/cgi-bin/wms.pl/29>



Figure 4 **One-off demonstrations in school assemblies are often long remembered**

the time of writing we have not been into the participating schools to see the level of ingenuity of the children, but we expect to see variations of water clocks, pendulums, slow-burning tapers or candles, shuttle-running or marble-rolling.

■ **On-line science quiz:** The School of Chemistry makes use of a computer system called *Blackboard*. The system allows images and web-links to be added to questions, and for multiple-choice questions to be weighted according to difficulty. A quiz has been trialled that allows children to search for

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