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FEATURE

Coming out of their 'Shells'

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Coming out of their 'Shells'

Chris Fraser describes the benefits of a productive partnership in science education

Using 'hands-on' science centres and outreach workshops offers class teachers additional ways to enhance and extend the science curriculum. As well as promoting positive attitudes to science, these activities offer opportunities to develop science investigation skills, knowledge and understanding. However, workshops and visits are often seen as end of topic 'treats' rather than essential educational activities. As part of their fourth year studies, nine BEd students at Aberdeen University elected to explore how these 'treats' might become integral components of their science plans.

Partnerships

The School of Education already worked closely with Satrosphere, Aberdeen's hands-on science centre, and with Shell Education Service to enhance initial teacher education (ITE) and continuing professional development (CPD) programmes. Two successful independent partnerships had built up over the last five years, enabling students and teachers to use visits to Satrosphere and Shell workshops to support their science teaching. During one meeting, the idea of integrating classroom lessons, Shell workshops and science centre exhibits was mooted, resulting in a new, three-way partnership.

Students

In the first semester, fourth-year BEd students selected a Scottish curriculum area or initiative for further study. Building on a compulsory course taken in the second year of the BEd programme, nine students elected to develop their science capabilities. When asked about their reasons for choosing the course, confidence, particularly in relation to practical investigative activity, emerged as the most popular reason. Typical student comments were:

> To become more confident when teaching science…
> I would like science to be my speciality, with a more in-depth knowledge of investigative skills.

Learning more about science concepts, and how to inspire and motivate learners featured in students' initial comments. Students also identified their need:

> To learn how to teach science in a way that involves the children's own ideas so they are finding out for themselves…

Project outline

After revisiting briefly ideas about children's learning in science, students explored the ideas associated with sound as a form of energy and worked together to construct concept maps. Using the SPACE report on sound (Watt & Russell, 1990) and additional materials students explored children's preconceptions and their persistence (Asoko, 2002; Roden, 2005). This modelled approaches they would take later to support their practical work in schools. Background reading included chapters on learning at museums and hands-on centres (Braund & Reiss, 2004) and creativity (Johnston, 2005). Next, students visited Satrosphere science centre to see for themselves how children engaged with the exhibits. Liz Robertson and Martin Wesley provided training in four Shell Education Service workshops: simple electrical circuits, solar power, elastic-band power, and wax. After time to research children's preconceptions, organise and practise, students took the workshops into two Aberdeen City primary schools.

Working with children

At each school, five classes took part in one or more of the workshops related to their programme of

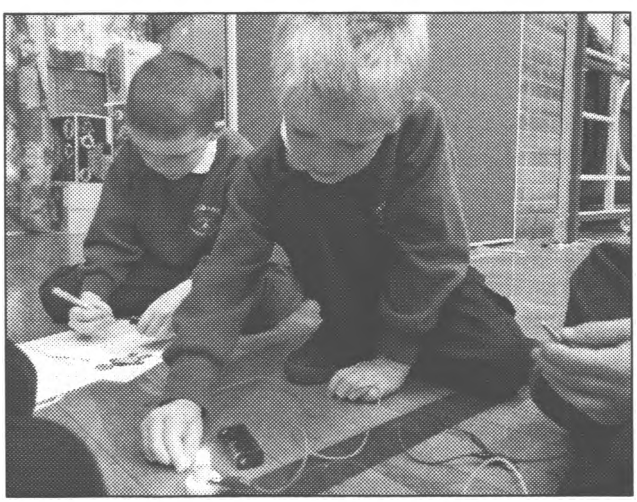

Fig1 Exploring electric circuits in the early stages workshop

study for the year. Students worked in pairs to set up and run the workshops with support and assistance

from Shell Education Service trainers, Aberdeen University tutors and class teachers.

Simple circuits

Two early stages classes engaged in a 'circus' of problem-solving activities to develop knowledge of how electrical circuits work. The youngsters were challenged to light the bulb, using just a battery, wire and the bulb (Figure 1) and to make a toy train work. Sending signals using coloured lights, making a 'Happy Face' light up and building a burglar alarm provided additional contexts for exploring simple electrical circuits.

Fig2 Bright lamps supplement sunshine in inverstigating solar power

Solar power

Older children also investigated electricity, using solar cells. Using bright lamps to supplement the wintry Aberdeen sunshine, children constructed simple circuits which included a motor and a propeller and were powered by solar cells (Figure 2). Following the children's suggestions, various factors affecting the speed of the propeller were investigated and sustainable energy issues discussed.

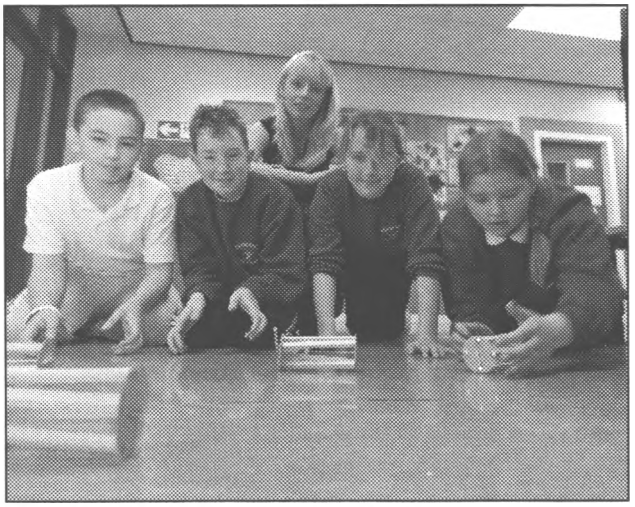

Fig3 Elastic band rollers are put to the test

Elastic- band power

Energy of a different sort was the subject of a workshop based on the traditional 'cotton reel' tank. Students helped children to construct elastic band rollers (Figure 3) and investigate the effects on speed and distance travelled of wheel diameter, axle width, rubber band width, and number of times the rubber band was wound.

Wax

Children made close observations of how a candle burns and examined changes of state using paraffin wax. The effects of translucency and colour were

Fig4 Science 'magic' with creatively dipped candles

demonstrated as children each 'dipped' their own candle. Using tape to mask areas of a plain white candle, the candle was first dipped into coloured wax. The tape was then removed and the candle dipped into a different coloured wax. The multicoloured results produced gasps of delight from the children and a sense of 'magic' (Figure 4).

Later, students returned to Satrosphere to see how children from one of the schools interpreted the exhibits in the light of the in-school experiences described above. Students identified relevant exhibits then observed children's actions and listened to their conversations. Initially, they thought that this would be sufficient to discover whether the children were able to make links between, for example, the light exhibits and colour, or materials exhibits and translucency. However, we encountered one of the difficulties documented by Falk and Dierking (cited in Braund & Reiss, 2004), namely that teachers, even student teachers, have an adverse effect on pupil discussion about the exhibits! Nevertheless, a little 'parallel play' and feigned ignorance on the part of the adults resulted in a limited insight into children's thinking.

Back on campus, with research into children's preconceptions completed, concept maps

re-examined and experiences discussed, students produced outline plans showing how, and when, they might use Satrosphere exhibits and Shell workshops as integral features of their science teaching.

Perceived benefits

From the participating schools point of view, children were able to engage in workshops that were related to their programmes of study. The students and mentors, working with the class teachers, provided a level of support for children that might be difficult to achieve regularly, e.g., in constructing elastic band rollers. Shell Education Service provided 'unusual' resources, e.g., equipment for melting wax, or those unavailable in sufficient quantities, e.g., solar cells. Above all, it was an opportunity to engage in novel and entertaining science.

Within the academic environment, it can be difficult to provide opportunities for planning and running practical activities with children. School placement is the obvious opportunity, but students are aware that they are being assessed during this time and therefore may be less willing to undertake practical, investigative science or engage with external resources. Personalising the 'tried and tested' workshops gave students the freedom to concentrate on creative delivery and responding to children's ideas rather than planning issues. Linking the workshops to science-centre activities and work on children's preconceptions allowed the students to see how these aspects should be integrated fully into their teaching plans. It appears that the desire to develop confidence has been achieved, if the following quotation is representative:

> The Science Elective was brilliant. The Shell workshops and the opportunity to do them in class have really boosted my confidence.

From the partners' viewpoint, the project cemented established links and developed a more holistic way of looking at how community resources might support primary school science. It is hoped that this collaborative approach can be extended in future years.

Acknowledgements

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Satrosphere can be contacted at http://www.satrosphere.net/

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