



Figure 1 The house with Jack, Morag, heaters and datalogger

DOLL'S HOUSE SCIENCE

Bob Kibble shows how Jack, Morag and Hector saved the planet!

Global citizenship and a sense of environmental custody are ideas that we hope to instil in learners. Schools often make use of the domestic environment, perhaps home, garden or school, as a local resource on which to hang ideas such as care, shared responsibility, and respect for and appreciation of surroundings. The idea of using a doll's house to help focus learning and teaching about the above outcomes came to me during a train journey from

Edinburgh to London. With the bulk of the newspaper read I turned to the drop-out supplements and found a flier for a toys retail store. On the front page was a doll's house. The penny dropped.

I bought my flat-pack doll's house from Argos for less than £50. It came complete with furniture and two inhabitants – I call them Jack and Morag. Assembly was as straightforward as flat-pack can be! I blocked the windows with cellophane and coloured paper for a curtain effect, and this reduced draughts. I glued down all furniture and inhabitants as a safety measure. So successful was the first project that we have now assembled a second house and use both with trainee primary teachers.

My first experiments made use of thermometers to record the temperatures in various parts of the house when a heater was introduced on the ground floor. I used thin digital thermometers

supplied with a popular datalogging kit. Two kits were used, *EasySense Q* from Data Harvest and *Log-Box* from TTS. By drilling holes in the back wall of the doll's house I could insert the thermometers and then close all doors to allow the rooms to warm up, using a nightlight as a heater. Two nightlight candles, held in sturdy glass holders to avoid toppling, did a good job of heating the house (Figure 1). Take care to monitor candles at all times and do not place them too close to a flammable object. My ground-floor plan allowed for plenty of space for the heaters.

Ideas for experimenting Heating the house

The first investigation was to explore how the temperature of different rooms changed when the heater was placed at ground level in the living room. Which room will Morag be warmest in? Why do you think this? Let's find out.

I found that the TTS software provided the easiest-to-read data, with clear values displayed, together with units, on the laptop (Figure 2). The *EasySense Q* was rather better for graphical display. I am not going to tell you the results in this article, as it is important for you and your learners to discover what happens for yourselves. Suffice to say there are significant differences in the temperatures of the different rooms and these differences will appear after about 15 minutes of recording.

With a piece of stiff card cut to the appropriate size and some fluffy cushion stuffing material/cotton wool, I made an insulated ceiling/loft, which can be slotted

Much teaching and learning can follow from the datalogging investigation. This learning might be about science ideas, such as: Why do the room temperatures level off at a greatest value after half an hour, even though the heater is still providing energy? That is a tricky and challenging question and one which is worth posing. Of course the energy is being transferred out of the house through the walls and cracks as fast as the heater is providing it. This is a balance (thermal equilibrium) situation. Learning might also incorporate ideas about controlling our environment – thermostats and their use, feedback (how does the kettle know when to switch itself

the roof with sticky tack.

These ‘alternative’ energy sources can be linked up to show energy transfer to items within the doll’s house (Figure 3). I used a small fan (an extractor fan perhaps) and also an LED (might this represent a piece of electronic equipment such as an *iPod?*). The fan and LED units came as accessories with the wind-turbine kit. The wind-turbine has to be driven by a wind source. A desk fan can be

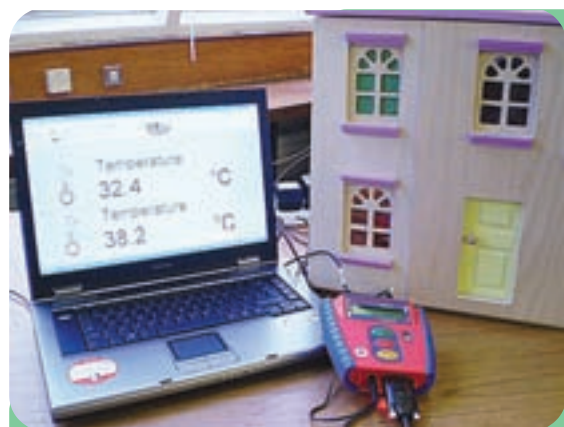


Figure 2 (left) TTS logger software offered clear temperature readout and units

Figure 3 (below left) Jack benefiting from wind energy and Morag from solar energy

Figure 4 (right) Hector and his solar-powered car



used to simulate a windy day. However, take care to establish that in real life the natural wind energy is what we hope to harness.

I have used a digital video camera to create a short domestic documentary story about Jack and Morag and their pet hedgehog Hector. In the video we visit Jack and Morag in their home, we see how they are reducing their carbon footprint by using ‘alternative’ renewable energy sources and we see Hector saving energy by riding about on his solar-powered car (Figure 4). Children could be invited to make such a video story, together with voice overdub using simple commercial video-editing software, such as *PhotoStory*. Alternatively, you could create your own for use with children.

Curriculum and learning

There is no doubt that the doll’s house is motivational. It is bright, interesting and easily manipulated, as I have indicated in this article. But these features, on their own, are not enough to justify spending £50 on an educational resource. What is the value of the doll’s house for learners? Let’s explore some



off?), what are fossil fuels and why should we conserve them?

Alternative energy

An extension to the environmental monitoring described above was developed with my trainee primary students.

in above the upper floor. What effect does insulating the house have on the temperatures of rooms? That’s another challenge for you! I know the answer and have the doll’s house evidence to prove it!

What happens to the room temperatures when you leave the front door open? What about a windy day (arrange for a desk fan to blow cool air towards the house)? I will leave these questions for you and your pupils to explore.

Still on the theme of energy, could the doll’s house be used to help learners explore ideas about alternative energy sources, in particular renewable and clean sources? Figure 3 shows how the doll’s house was presented in order to promote discussion and learning about ‘clean’ energy. I used a wind-turbine unit, which can be sourced from a variety of suppliers – at least two versions are on the market. Added to the house was a set of solar panels; I mounted them on card fixed to

added value which could result from the doll's house science:

- Experience with ICT, especially dataloggers and sensors. To appreciate how ICT can be used to monitor our environment. Weather stations, satellites and room thermostats all make use of ICT to monitor and control environmental conditions.
- Measurement and recording skills. Appreciation of how scientists gain understanding by recording data and looking at patterns.
- Understanding the concept of energy transfer, convection and the idea of insulation.
- Experience in talking about energy transfer from 'alternative' sources, clean energy, free energy, renewable sources and ideas relating to carbon footprint and fossil fuels.
- Modelling to help us understand larger scale issues. Even simple models such as a doll's house can be used to test the effects of locating heaters, opening doors, insulating lofts and adding draughts.

One of the four capacities within the Curriculum for Excellence in Scotland is that of responsible citizenship. The National Curriculum in England and Wales includes an entitlement that children develop as 'active and responsible citizens, to research, discuss and debate topical issues, problems and events'. These aspirations are reflected in the more detailed outcomes statements.

The revised science curriculum in Scotland contains this draft outcome and experience statement:

I can use my knowledge of the different ways in which energy is transferred between hot and cold objects to design an energy efficient building. (SCN309F)

The Science National Curriculum for England and Wales includes:

Use simple equipment and materials appropriately and take action to control risks.

Make systematic observations and measurements, including the use of ICT for datalogging. (Obtaining and Presenting Evidence in KS2 Science linked to levels 3 and 4)

Working with others to explore a variety of information sources and ICT tools [for example, searching the Internet for information about a different part of the world, designing textile patterns using graphics software, using ICT tools to capture and change sounds] ... investigating and comparing the uses of ICT inside and outside school. (KS2 ICT)

There are also further links to geography.

I am convinced that the doll's house experience, whether used with younger learners in role-play and storyline activities, or with older learners in a more quantitative study of environments, can provide a platform to help learners reach the curriculum aspirations stated above. Looking back you might find it hard to find better value from an outlay of £50 and some flat-pack patience!

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