Get out of the classroom to study climate change

THE 'SPRING BULBS FOR SCHOOLS' PROJECT

Danielle Cowell *and* **Richard Watkins** *describe a museum outreach project in Wales that gives children the chance to adopt their own spring bulbs and take part in a real climate-change study*

Climate change: What should we teach?

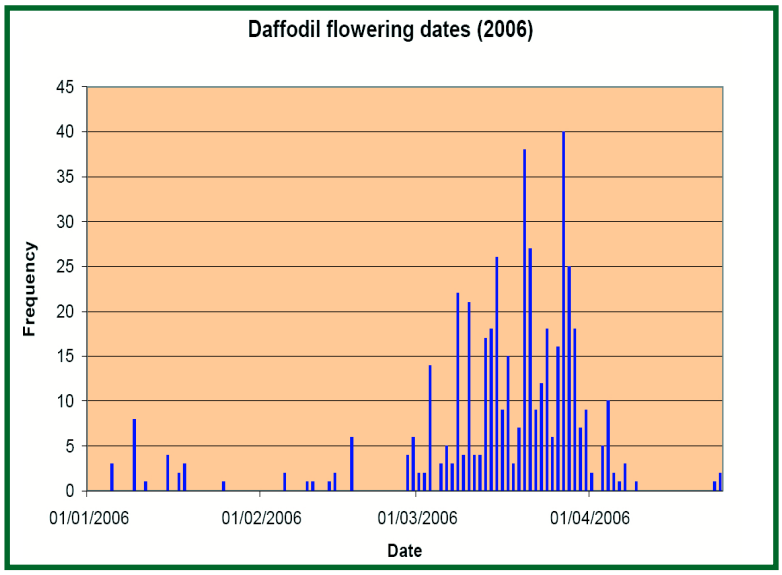
Experts predict that world temperatures could rise by 1.5 to 6 degrees in the next 95 years! To put this into context, consider that our last ice age was just five degrees colder than today. Any child who has seen the cartoon *The Ice Age* could tell you what the climate during an ice age is like. They would describe a very different landscape to that we enjoy today. So what does the future hold? Our children need to understand and be prepared for the changes that will occur throughout their lives but how can we teach this without being negative?

It is becoming clear that human influences are a significant factor driving climate change. Education is one of the main weapons in influencing patterns of behaviour and teachers inevitably have a crucial role to play. Teachers need to be fully aware of issues surrounding climate change in order to be positive role models for children and to foster balanced and informed opinions – key elements of scientific literacy. They need to provide children with fun and positive examples to help them become aware of and adapt to the changes that climate change is bringing. This is why the *Amgueddfa Cymru* – National Museum of Wales – offers the 'Spring Bulbs for Schools' project to all schools in Wales.

Aims of the project

Observations and recordings of leaf budding, flowering and migrations seem to be indicating a change in the timings of the seasons. Rising temperatures over the last century are causing flowers and leaves to open early and migratory birds and bees to be seen for longer throughout the year. The Spring Bulbs for Schools (SBS) project aimed to find out how temperature changes are affecting flowering times in spring bulbs, whilst educating children about climate change, nature and science. By studying the trends in spring bulbs year after year, children will find out how changing temperatures are affecting flowering times. Spring bulbs are very useful tools for measuring climate change because they adapt to changes in temperature. In a cold spring, they flower late and in a warm spring they flower early. The Royal Botanic Gardens at Kew, the Phenological Society and the botanical gardens in Scotland

Figure 1



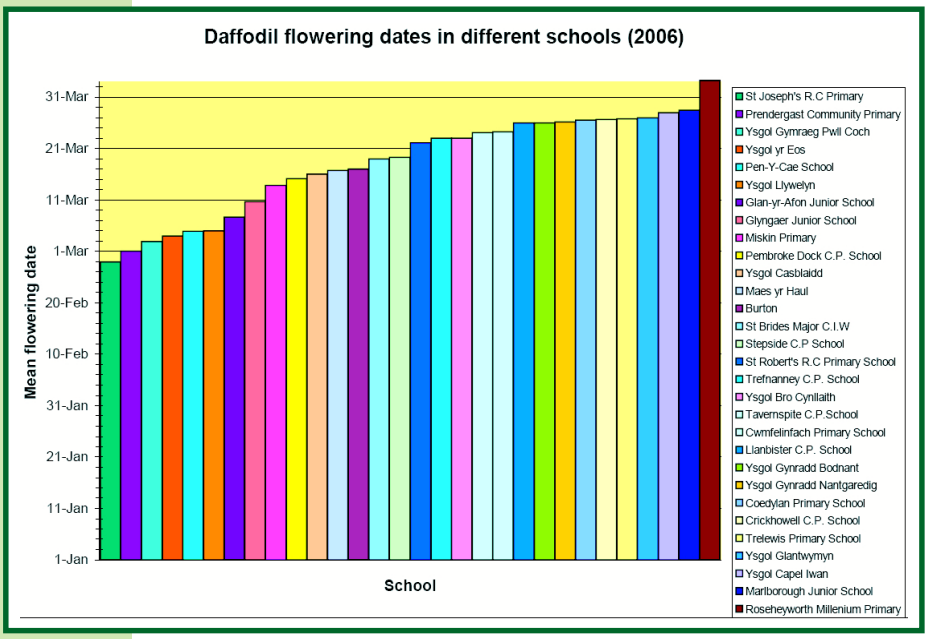
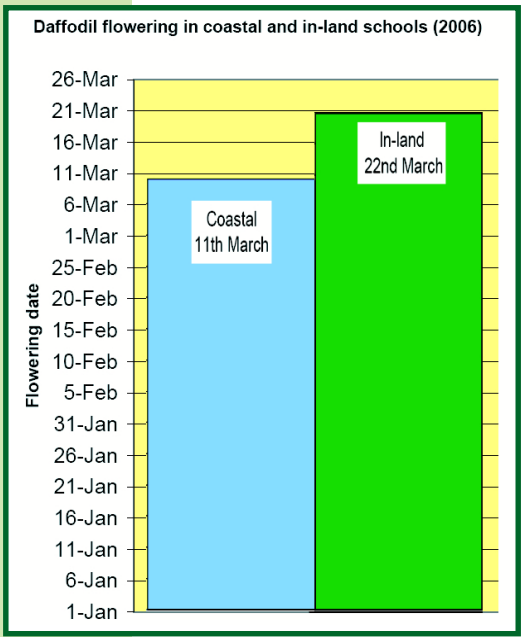


Figure 2

Figure 3



have kept a database of flowering records for hundreds of years; this study of the timing of natural events is called phenology.

What we did

In 2006, 160 school research sites were set up across Wales, following successful trials with 60 schools in 2005. We worked with teachers, children and local Careers Wales and Education–Business Partnerships to fund seven teacher placements. During the placements, teachers received advice, equipment and the resources required to take part in the investigation. Teachers' continuing professional development (CPD) placements were supplemented with other relevant hands-on activities and educational opportunities. In 2005, SBS toured with the Woodland Trust's *Nature Detective* programme and, in 2006, with the National Museum's 'Get Set for Science' programme run by the Natural Science Education Officer, Ciara Charnley.

The equipment consisted of a teacher's pack, wall charts, bulbs, pots, thermometers and access to the SBS website. Each school received enough bulbs for one class or year group. Typically, each school received 30 Tenby daffodil bulbs (*Narcissus obvallaris*), 30 crocus bulbs (*Crocus tommasinianus*) and 30 two-litre pots. Each school followed protocol for planting, watering, caring and recording. All schools planted their bulbs on the 20 October and placed them in a sunny outdoor position within their school grounds. Children were asked to care for and adopt their bulbs and complete a bulb adoption certificate. Throughout the autumn term children were to keep daily temperature and rainfall records – this continued until the end of March. In the spring, the children were asked to record the flowering date, maximum height and total number of flowers produced by their bulbs. Results were reported to the SBS website. Then each child was rewarded with a 'Super Scientist' certificate.

The resources

The project was designed as a distance-learning package using a combination of delivery mechanisms. After receiving the initial face-to-face training and paper resources teachers were encouraged to download resources from the SBS website. The project officer maintained contact with the teachers throughout the year by letter, email and telephone when necessary. The resources varied from a series of *PowerPoint* files to basic worksheets – which teachers were advised to use as they pleased. Friendly characters such as Professor Plant and Baby Bulb were introduced to explain the investigation to the children. *PowerPoint*'s were designed to

guide the childrn through each stage of the investigation; they were provided in note form during training and could be downloaded for use on the electronic whiteboard. '*A letter from Professor Plant*' invited children to participate; '*Adopting your bulbs*' advised children on plant care, bulb adoption and making plant labels. '*Planting your bulbs*' advised schools on a planting protocol to ensure a fair test and '*Keeping records*' explained what should be recorded.

The results so far ...

In total, in 2005–2006, the first year of the investigation, 501 daffodil and 468 crocus flowers were recorded and reported. The mean flowering date for the crocus was 25 February and the mean flowering date for the daffodil was 18 March. As this is the first year of the investigation no comparisons with previous years' can be made, but there are plenty of interesting trends to study, particularly how the geographical location of the schools affected flowering dates.

Study the graphs or plot your own!

Schools were able to download the results from the SBS website and use them as part of the *understanding and interpreting* science curriculum. A table summarising all the results collates the mean flowering dates for daffodils and crocuses, heights and geographical information (grid reference, city/town/rural, valley/non-valley, area of Wales, coastal/non-coastal) for each school. The data was also presented in graph form. Teachers were provided with a simple list of ideas on how children could use the data. Children were given opportunities to use the graphs to study trends and draw their own conclusions.

Figure 1, for example, shows daffodil flowering dates. Schools were able to use this frequency chart to study the most common flowering date (or the mode), which was 28 March for the daffodil (28 February for the crocus). Figure 2 shows daffodil flowering dates in different schools. Schools were able to compare their flowering dates with those from other schools and determine why their flowers opened early or late.

Trends and possible explanations:

Figure 3 compares crocus and daffodil flowering in coastal and inland schools. Plants grown in coastal schools flowered earlier than those grown inland. Coastal areas do not experience such cold nights during the winter because the sea acts like a blanket warming up the coast. Coastal schools were defined as those less than two miles from the coast.

Figure 4 compares crocus and daffodil flowering in cities, towns and rural schools. Plants grown in cities flowered earlier than those grown in towns and rural areas. Cities are warmer than rural areas because they are better at storing heat. Major towns and cities contain lots of concrete. Concrete absorbs heat and releases it slowly – much like an electric storage heater. (See BBC website for more information on this.)

Figure 5 compares crocus and daffodil flowering in valley and non-valley schools. Plants grown in valleys flowered later than those grown in non-valley areas. Valleys are colder than other areas because cold air sinks into them at night.

No major differences were found between flowering times in North, South, West and Mid Wales. Many of the northern schools were near the sea and therefore probably warmed by the coast. There were very few schools based in North and Mid Wales.

Evaluation

The project provided children with the opportunity to use their outdoor classroom and take part in a real climate-change study, as well as offering lessons in science, maths and ICT. Children engaged in hands-on activities, reinforcing the essential basic skills needed for scientific enquiry. Working with crocuses and daffodils made them aware of the importance of bulbs in the life cycle of some plants. On a more general level, they become aware of the world around them and the idea that human activity can have noticeable effects, even on a local scale in the school garden.

The children were highly motivated by being involved in helping the museum with an important project. In the author's school year 6 children adopted the scheme and proved very reliable at taking daily rainfall and temperature

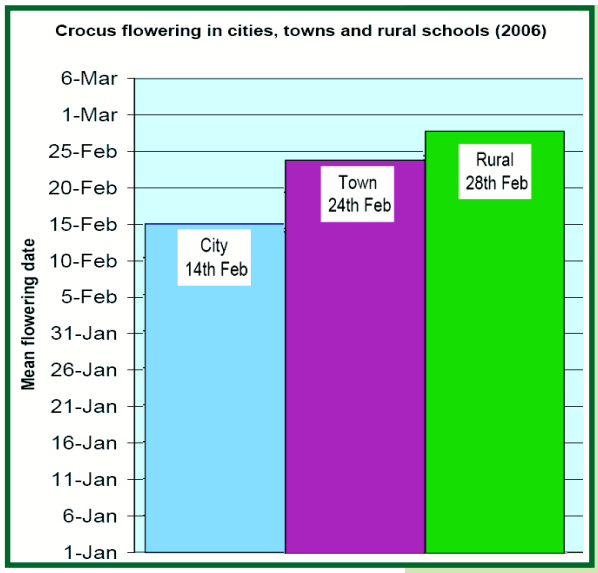


Figure 4

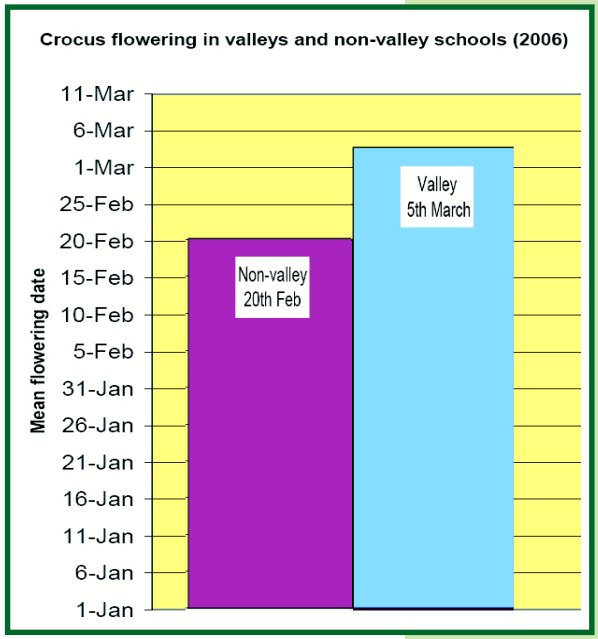


Figure 5

readings. The children then accessed the museum's website to upload the school's weekly data and eagerly anticipated which school in Wales would produce the earliest flowers. Not only did these activities allow the children to practise some very valuable science process skills, but they highlighted the power of the Internet and email as a communication tool. On a more general level, the project enabled them to undertake pattern-seeking and observational activities – aspects of scientific enquiry that are often underdeveloped throughout the science curriculum.

For teachers the project provides free resources for science and the confidence to tackle the difficult issue of global warming. For the museum, it is an opportunity to reach out to all the schools it serves. The project highlights the fact that museums play an important role in understanding our past and unravelling our future. In fact, many of the specimens used by climate scientists to study the past and predict the future are preserved within museums. The National Museum's Spring Bulbs for Schools project is raising children's awareness of the Earth's changing climate and the impact on our own environment.

Websites

SBS website: www.museumwales.ac.uk/scan
BBC weather website: http://www.bbc.co.uk/weather/features/understanding/microclimates.shtml

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