



Seed Cities for Science

A COMMUNITY APPROACH FOR A SUSTAINABLE GROWTH
OF SCIENCE EDUCATION IN EUROPE

Cross-curricular Hands-on Primary Science

Autumn 2006





Cross-curricular Hands-on Primary Science

Leicester is one of 12 'seed' cities in 12 European countries: UK, France, Spain, Italy, Portugal, Estonia, Hungary, Sweden, Belgium, Germany, Netherlands and Slovenia. The European Commission has provided funding to support European schools to raise standards in investigative primary science. Fourteen Leicester city schools are participating in the first year of this 3 year project to

- Promote practical investigative work
- Develop creative activities and to make better cross-curricular links
- Use the environment and facilities within the city to enhance science
- Disseminate and share good practice between colleagues in UK and other EU countries

The 33 teachers in the first year of the project are being given 2 days and 3 twilight in-service sessions which are intended to support them to develop innovative practice. A day's in-service was given by Tina Jarvis and Rosemary Feasey at the Regional Science Learning Centre East Midlands in October. The day covered a discussion about making cross-curricular links with science. There were also workshops on science skills, literacy and history in the context of light and electricity.

During November each teacher tried out and extended at least one the ideas with their classes. Each class was visited by Karen Stuart or June Agar who provided an audience for the children to show their science work. This pamphlet gives a taste of the wide variety of sessions that were observed.

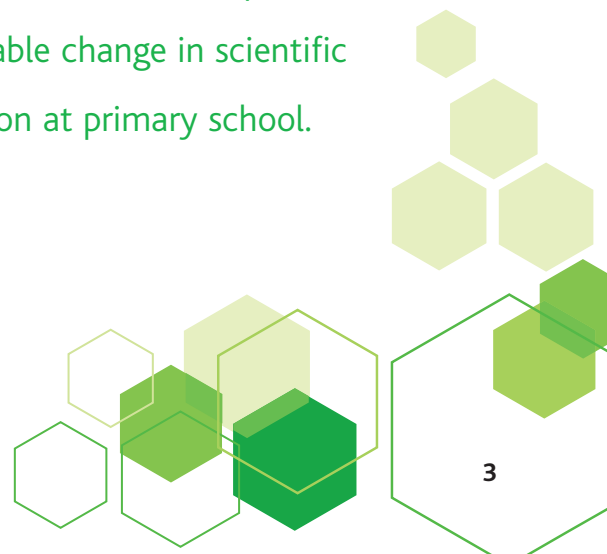
Schools in first year of the Project

- Catherine Infant School
- Coleman Primary School
- Dovelands Primary School
- Heatherbrook Primary School
- Holy Cross Catholic Primary School
- Humberstone Infant School
- Linden Primary School
- Mellor Primary School
- Northfield House Primary School
- Rushey Mead Primary School
- Sacred Heart Primary School
- Scraftoft Valley Primary School
- St Joseph's Primary School
- Wolsey House Primary School

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The Pollen Project is inspired by the vision of the French physics Nobel laureate Georges Charpak who stimulated the interest and concern of worldwide Academies of sciences about the need of a deep and sustainable change in scientific education at primary school.





◀ Experiencing the effect of darkness and different light sources

Inspired by a display by Chris Ofili at Tate Britain, teachers set up a dark room which was lit by a variety of small lights such as a candle, diva, lava lamp, fairy lights and glow sticks. The children were taken into the room, but before entering they had to stand behind a dark curtain to allow their eyes to adjust. They had a discussion about what they thought darkness was; how they felt; and what they noticed as their eyes adjusted to the dark. Once in the room, they sat in a circle and were shown different sources of light, starting with the candle. They were then shown a diva that cast shadows on the carpet and were invited to say how they thought shadows were formed. This initial discussion was followed by a period of free investigation in which the children had access to torches, mirrors, cellophane and lamps, tinsel, spoons etc. The children were encouraged to use correct scientific terms. The session finished with the children being shown a PowerPoint presentation of Chris Ofili's work, showing his use of light and materials. A subsequent art lesson used ideas based on his work.

Foundation – Year 2 · Cross-curricular link: art

Examining different light sources

Year one teachers in different schools took the story "Can't You Sleep Little Bear?" as their starting point. This gave rise to explorations to find a light source that gave the bear enough light in his cave to feel secure, but not so much that he could not sleep. Another class explored, discussed and described a variety of light sources through history. They talked about their efficiency and how light was produced.

Year 1 · Cross-curricular link: literacy



◀ Investigating lighting for Rama and Sita's return

Diwali provided the starting point for an investigation. Having heard the story of Rama and Sita's return to Ayodhya, the class decided that diva lamps with their naked flame would not be ideal to light their way back through the forest and that torches would be preferable. The pupils were challenged to investigate which torches would be brightest. They did this by shining a variety of torches onto black paper and into shoe boxes. In doing so, they were also encouraged to closely observe the bulb, the filament and the reflector. When one boy observed that the filament inside the bulb looked like a wick, the teacher encouraged him to notice the differences and to discern the thin wire joining two more sturdy contacts. The pupils were also helped to explain the differences between torches. When they looked at how the torch beams varied at different distances from the paper, some children thought the colour of the torch barrel was important but concluded after discussion that the state of the charge in the batteries was the important factor.

Year 1 · Cross curricular links: RE and literacy

Investigating transparency and translucency to make a 'stained glass' window

This class' task was to make a stained glass window for the school for Christmas. Groups of pupils sorted paper into three categories: transparent, translucent and opaque. They tested for these properties by holding up the papers to the light or shining torches through them. Results were recorded by sticking the papers onto on a chart. The first task was followed by identifying grades of translucence for use in the window, further refining the pupils' understanding of the concepts.

Years 3 & 4 · Cross-curricular link: RE and art



Investigating how to vary a motor's speed to make a pinwheel

One class looked at Victorian kaleidoscopes, pinhole cameras and epidiascopes. They then looked at early attempts at creating the illusion of moving images using light. Pupils were given a tray of electrical parts and worked in pairs to make pinwheels powered by a motor. The pinwheel had slats, which when viewed in a mirror could show pictures as a moving image. The pupils had to make the wheel spin at different speeds to get the optimum effect. This involved adding a bulb to the circuit or weights to the wheel to slow it down and extra batteries to speed it up. This manipulation of variables in circuits was new to the class.

Years 3 & 4 · Cross-curricular links: history and design & technology

Investigating materials for an effective World War 2 blackout

The task for the Years 5 and 6 class arose from an authentic oral history account by a lady called Pearl of her World War 2 experiences and how she had to make sure that her blackouts met the exacting standards of the strict air raid warden. To prepare a report for Pearl on possible blackout materials, the class had to investigate a selection of materials. Using a lightbox and a torch they had to find the best combination of layers and/or colours to do the job. Some used dataloggers to help them find the answer. The pupils presented their findings and conclusions, supported by their own graphs, tables and bar charts. They were required to make sure all their testing was fair. They were also asked to give sound, scientific feedback that was clear and accessible.

Years 5 & 6 · Cross-curricular links: history and literacy



Creating a presentation to explain vision to younger pupils

The teacher of a mixed Year 1 and 2 class set up a mock argument between two pupils for the benefit of a Year 6 class. One pupil maintained that the brain sent messages to the eye and the other said that the eye's pupil controlled how we see. The Year 6 class was then challenged to design a presentation for all the Year 1 & 2 pupils to explain the mechanism of sight. They showed their presentation, using PowerPoint, diagrams and a light box as teaching aids. The literacy challenge was to use language that would help a much younger age group understand the concepts.

Year 6 (in conjunction with Years 1 & 2) · Cross-curricular links: ICT and literacy



'Apprentice electricians' create flashing headdresses

The class were given the real job of helping Key Stage 1 stage their end of term production. This involved a mixture of technical and creative tasks, all of which were displayed on a flow chart created by the pupils. In this way, they could keep track of their progress. One task was to create flashing headdresses for the Key Stage 1 pupils to wear 'on stage'. For this, they were enrolled as apprentice electricians under the direction of the teacher who convincingly acted the role of their demanding boss, Jeff. The pupils entered into that spirit, made the circuits, had them checked by 'Jeff' and got the all important tick on their job cards.

Year 4 · Cross-curricular link: design & technology

Group challenges on creating circuits

The children had been constructing simple circuits, but now they were set new challenges: lighting a bulb without a bulb holder; inserting a second bulb into the circuit and making a circuit with a buzzer in it. Their knowledge of electricity was reflected in their enthusiasm to share their thoughts and ideas. Some pupils did not believe that a bulb could be lit without a bulb holder. They changed their view after the exploration. During the plenary the children were asked to present their circuits and talk about why and how they worked or not.

Year 2 · Cross-curricular link: speaking and listening



An assembly on electrical items and circuits

A class that had been studying electricity prepared an assembly about what they had done. They talked about different objects that use electricity and how they sorted them into those that produce sound, light, heat and movement. The children also talked about the construction of a complete circuit. A small group did a dance to illustrate this. On their own initiative, two boys had made posters at home warning of the dangers of mishandling electricity which they also presented and explained to the assembly. While the children had been constructing their electrical circuits, they had acted as apprentice electricians working towards an 'Electrician's Certificate' which was awarded by their supervisor (the teacher) once they had completed their tasks. The children paraded their Electrician's Certificates proudly around the hall at the end of the assembly.

Year 2 · Cross-curricular links: speaking & listening and dance



Lighting up model Christmas trees

In two mixed Years 3 & 4 classes the pupils were asked to design Christmas trees using their knowledge of electricity. The trees were made and decorated and the children made a series circuit with three or four bulbs to put on their tree. It was inserted between two tree shapes which were then joined together. The small groups were required to explain how their work on conductors and insulators was relevant and how to make different circuits. The teachers also used the idea of pupils being 'Apprentice Electricians' introduced during the in-service day.

Years: 3 & 4 · Cross-curricular links: RE and design & technology



Investigating loudness of shakers for a giant and a fairy

As a starting point, the teacher made a big show of opening an oversized letter from the giant in Jack and the Beanstalk. In the letter, the giant explained that he wanted to go to a party with his friend the fairy and they both wanted to take shakers along to provide the music. The giant wanted the loudest shaker and the fairy wanted the quietest. Fortunately the giant had sent some beans, supplied by Jack, and other materials to make the shakers. The pupils' task was to investigate which shaker would meet the giant's and the fairy's needs. After looking at the beans and rice, the children predicted the kidney beans would make the loudest shaker. Groups of four set about making the shakers to the giant's specification. There was also an extension activity for those who finished early. They were asked to find out whether there was a difference in loudness between having a few or many beans/grains of rice in the shaker. They discovered that it was the chickpeas that made the most noise. They decided that it was not just size but also hardness that mattered.

Year 1 · Cross-curricular links: literacy and design & technology

Exploring forces in old and new toys

A book about pushes and pulls which had been used in a literacy lesson was revisited when the history of toys was explored. Actual toys were collected from previous generations of the pupils' families. The children looked at these and compared them to their modern toys. The children were encouraged to use the language of pushes and pulls throughout the activity.

Year 1 · Cross curricular link: literacy and history



Controlling variables to make a musical instrument out of elastic bands

One class looked at pitched instruments to identify variables that could or could not be changed during an investigation. They then investigated rubber bands to explore how best to change the pitch of the note they produced.

Year 5 · Cross curricular link: music





Creating a book to explain the properties of materials

A Year 1&2 class received a request for help from Year 6 who were worried about their SATS tests in May. They asked the younger children to design and make books about specific materials to help them. To achieve this, the children had to sort materials from a tray of objects into rough, smooth, flexible, transparent etc. They were then invited to share their answers using the correct science vocabulary. The children made a mind map of ideas to include in the books they were preparing for Year 6.

Years 1 & 2 · Cross-curricular links: design & technology and literacy

Group challenge to separate a variety of solids

The pupils' task in their groups was to separate a variety of solids: e.g. rice, peas, paper clips and to select an appropriate sieve from the different graded-sieves around the classroom. The science focus was to help pupils to select the correct equipment. The literacy element highlighted the contrasting styles that are needed to write up a logical practical exploration as opposed to recounting a story.

Year 3 · Cross-curricular links: PSHE (sharing co-operating) and literacy.



Creating a model volcano

It was Volcano Week and the Year 3 classes had been studying volcanoes as a geography topic. The Year 4 class had been tackling the science of volcanoes separately. Now familiar with the structure, both age groups created a model volcano from paper and cardboard.

Year 4 · Cross-curricular link: geography and design & technology



Life Cycles, Nutrition and Micro Organisms



◀ Group challenge to sort and explain different life cycles

The lesson began with a discussion about previous work on life cycles. The children then sorted a mixed up frog life cycle together. The children then had to work in groups to sort, cut and stick pictures of other life cycles and to present them in the right order. During the plenary, the children had to sit with someone who had a different life cycle to them and tell them about it.

Years 1 & 2 · Cross-curricular link: speaking and listening

Healthy meals: Comparing today's diets with those in the Crimean war ▶

As part of a study about Florence Nightingale, the children talked about conditions during the Crimean war and soldiers' typical diet. After drawing a typical soldier's meal, an interactive whiteboard was used to show the different food groups and their part in promoting health and growth. The children had to 'drag and drop' items of food into the correct groups. From this they drew a healthy meal by choosing a food from each group along with a healthy drink. There was also a discovery area where children could sort plastic foods models into healthy and unhealthy categories. A Greedy Gorilla game was very popular. You drew a card. If the picture was on your board, you kept it. These were healthy foods. If it was junk food, however, the gorilla got it! After a while he burped – the children loved that!

Year 2 · Cross-curricular link: history & ICT



◀ Investigations into ideal conditions to grow yeast to make bread and yoghurt

The pupils had to investigate which conditions needed to be present to activate yeast. They tried putting it in warm, cold water or none at all as well as with sugar or without. The pupils were very familiar with the investigative process: from selecting the best method, making predictions and controlling variables to recording findings and making conclusions. Those who finished quickly were able to take on the fun challenge to see who could inflate the biggest balloon using the carbon dioxide from the fermenting yeast. The class applied what they had found out about micro organisms to making bread and yoghurt. They also wrote instructions for someone else to make them.

Year 6 · Main cross-curricular links: design & technology and literacy

Visit from a microbiologist

As part of 'Keeping Healthy' Week, two classes had a visit from microbiologist who explained the everyday challenges of her work at a major local hospital. This included details of how microbiologists take samples in the real world and how careful they need to be to make sure variables are controlled. The pupils were fascinated by this insight into this area of work that was getting so much media coverage. The classes made mind maps of what they had been told, giving them the opportunity to use a lot of very useful scientific language.

Year 6 · Cross-curricular links: speaking & listening



What Happens Next?

The Future

It is hoped that 100 Leicester city teachers will participate in the 3 years of the project. Over the three years cross curricular issues will be explored in 6 main areas:

- Forces
- Energy: light, sound & electricity
- Materials and their use
- Changing materials
- Investigating animals and plants
- Humans

Science Challenge

There will be an optional 'Challenge' in June and July each year. The topic for the 2007 Challenge is the 'Food of Science'. Pupils will be asked to:-

- To develop an investigation;
- Involve the Leicester city community in some way. This might be a business or museum visit; and
- Share their findings to the community such as making a display for a library or giving a presentation to parents.
- Leicestershire SETpoint is offering a prize for one Key Stage 1 and one Key Stage 2 class.

Links with schools in Europe

Science investigations can be shared with schools in another European country in the Pollen project. Coleman Primary School and the Pollen Science Centre in Portugal tried a web cam link in November 2006. Two groups of children shared their science activities. Coleman pupils carried out two investigations and sent a PowerPoint to Portugal. Six pupils explained their investigation about conditions necessary to grow yeast via the web cam. The English class saw the Portuguese pupils and their investigation on chestnuts and what would happen if you put chestnuts in a microwave with and without cuts.



Teacher's Comments



'A really exciting project to be part of.'

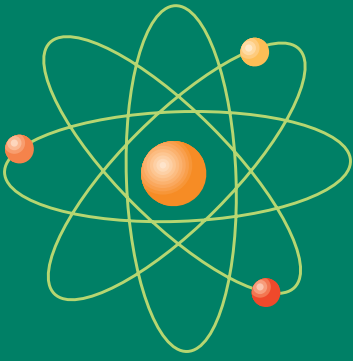
'A great starting point to take / can tell to others and to put into practice myself more. Thought provoking. Inspiring day.'

'My expectations have been exceeded! I now have far more ideas than I thought possible.'

'Gained insight into other people's schools.'

'I certainly got some excellent ideas about light and electricity and how to use a range of areas to support understanding. I am feeling very enthusiastic!'





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