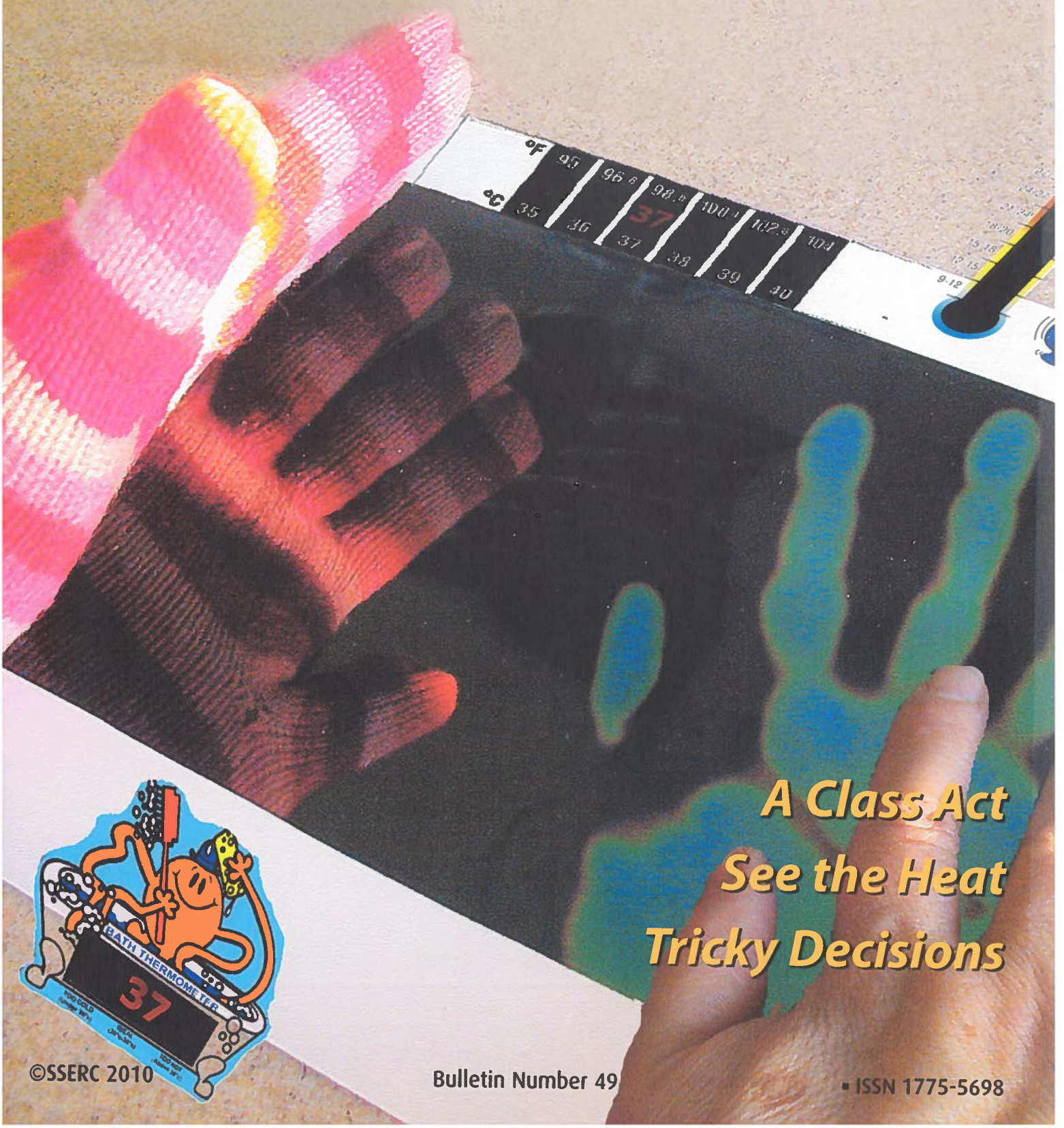
Primary Science & Technology Bulletin

Ideas and Inspiration for teachers in Primary Schools & S1/S2



A Class Act
See the Heat
Tricky Decisions

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Levers – A Class Act

Figure 1 – A racing car is in the pits for a tyre change. What job has the guy in the foreground got? What piece of equipment does he use?

This article as all about levers. Levers are everywhere in our daily lives, from the opening of a door to fishing [1]. We illustrate real-life scenarios where levers may be called for to provide the technological solutions to problems. In Curriculum for Excellence, Technologies, Technological developments in society the following Experiences and Outcomes can be addressed :

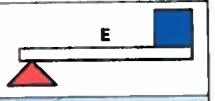
TCH 1-01a – *By exploring and using technologies in the wider world, I can consider the ways in which they help.*

A deeper investigation of how the lever has been used and developed over time (from the shaduf [2] to the JCB [3]) could provide activities to address **TCH 2-01b** – *I can investigate how an everyday product has changed over time to gain an awareness of the link between scientific and technological developments.*

Consider the following:

Scenario 1 - Your granny's arthritis in her hands is getting worse and opening jars is becoming increasingly difficult for her. Use the internet to find out what gadgets, costing less than £5, have been designed to make jar-opening easier. Chances are they will use some form of lever. Use the information below to try and find out which class they are.

A lever is a rigid bar that moves about a point called the fulcrum. It is used to move a load when a force, the effort, is applied.

Class of lever	1st	2nd	3rd
What's at the centre?	fulcrum (F)	load (L)	effort (E)
(Remember which is which with the mnemonic FLE for 123)			E
Lever diagrams			
Real-life examples	 see-saw (see also hand trolley, oars, crowbar, scissors)	 wheelbarrow (see also nutcrackers, spanner, stapler, hole-punch)	 fishing (see also tweezers, tongs, broom, forearm/elbow)

Scenario 2 - Two unlikely friends want to play on a see-saw together. One is a gymnast and the other a Sumo wrestler. This see-saw is unusual in that you are free to place the support (fulcrum), which usually sits in the centre, at any point along the bar. Suggest what arrangement of the equipment would allow them to play.

Scenario 3 - Heavy rock rolls on on to someone's leg and it's too heavy to lift directly. There's a big iron bar and a smaller rock to hand. How could they be used to lift the heavy rock enough to get the casualty out? How about a challenge to "Lift the Teacher"? Supply equipment like that shown in Figure 3.

The K'nex Education Kit (Levers and Pulleys – Introduction to Simple Machines) allows children to build a selection of simple machines based on levers is available from various suppliers (e.g. from Rapid Online http://tinyurl.com/Knex-levers, £19.95). The kit comes with a comprehensive teacher's guide which includes lesson plans with links to schemes of work at KS1 and KS2 in England.

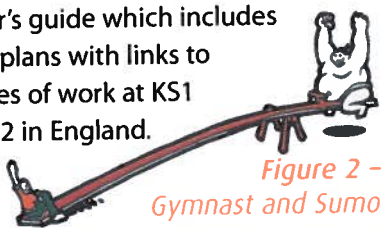


Figure 2 – Gymnast and Sumo

Although you could use equipment from kits like Knex and Lego for doing experiments with levers you might like to consider e.g. Corriflute, cotton reels, dowelling etc. as cheaper alternatives.

Go on a "lever hunt" around the school and photograph or video all the examples of levers that you meet.

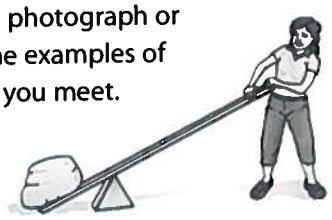


Figure 3 – Lifting heavy rock

References

[1] http://www.technologystudent.com/forcmom/lever1.htm – has nice animations showing typical real-life situations.

[2] http://www.historyforkids.org/crafts/egypt/shaduf.htm – Egyptian Shaduf Project from Kidipede.

[3] http://www.jcbexplore.com/ – JCB for kids.

Further websites

http://www.flying-pig.co.uk/mechanisms/pages/lever.html – provides an animated demonstration of the three types of lever.

http://www.explainthatstuff.com/toolsmachines.html

http://www.enchantedlearning.com/physics/machines/Levers.shtml

See the heat with thermochromic sheet

This activity formed part of an investigation in a Curriculum for Excellence, Sciences, Planet Earth, Biodiversity & Interdependence to support Experience & Outcome **SCN 2-01a**, *I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioural characteristics to their survival or extinction.* Similar activities could be used when teaching **SCN 0-15a**, *Through creative play, I explore different materials and can share my reasoning for selecting materials for different purposes.* and **SCN 1-15a**, *Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges.*

Thermochromic sheet is a wonderful way for children to "see" heat. The film (available from several suppliers including MUTR [1]) is black at room temperature but changes colour at temperatures above 27°C. The sheet gives a beautifully visual indication of changes in temperature and so it has uses in the primary school where measuring temperatures by other means may not yield conclusive results. The children may already be familiar with LCD type thermometers for measuring forehead, bath and bedroom temperatures (Figs. 1a, b & c). At our Primary Residential Courses this session a sheet of thermochromic film was given to each participant and used in a workshop about heat loss in animals. We filled universal bottles [2] with water from the hot tap and wrapped one in fur fabric. (Figure 2a). The sheet of themochromic film laid over this arrangement is shown in Figure 2b.

Figures 1a, b & c – LCD (liquid crystal display) thermometers.

A word of warning

Children may have difficulty understanding what they are seeing on the sheet and an introductory activity may be needed to make this clear. If you wear a glove on one hand which of your hands feels warmer? Yes, the one with the glove (Figures 3a & b). But which hand shows up bigger and brighter on the thermochromic film? The one that is losing more heat energy i.e. the ungloved hand. A big, bright pattern indicates that the object is losing heat energy. An additional question about the bottles could be asked – If both bottles start out with the same amount of heat energy, which is the one that would be more likely to cool down more quickly?

Thermochromic sheet can also be used to show up heat energy generated by friction (SCN 2-07a [3]). Usually children are asked them to rub their finger on the desk to 'feel the heat'. This activity allows children to both 'feel' and 'see' the heat (enegy). Covering the fingers with different materials produces interesting results. Therefore a comparison of the heat patterns produced by rubbing different surfaces on the thermochromic film may be possible. See the video on our website [4].

There is vast scope for extension work with this versatile material. We will return with more ideas in future issues.

Figures 2a & b – Universal bottles, with and without fur fabric and then with thermochromic paper laid over top.

Figures 3a & b – Gloved and ungloved hand placed on film then removed.

References

[1] http://tinyurl.com/thermochromic-film
[2] http://tinyurl.com/universal-bottles – available from Timstar.
[3] http://tinyurl.com/SCN-2-07a – Experience & outcome from CfE.
[4] http://tinyurl.com/Science-3-18-search – search for "thermochromic sheet".

Tricky Decisions in 2099

Figure 1 – Tricky Decisions.

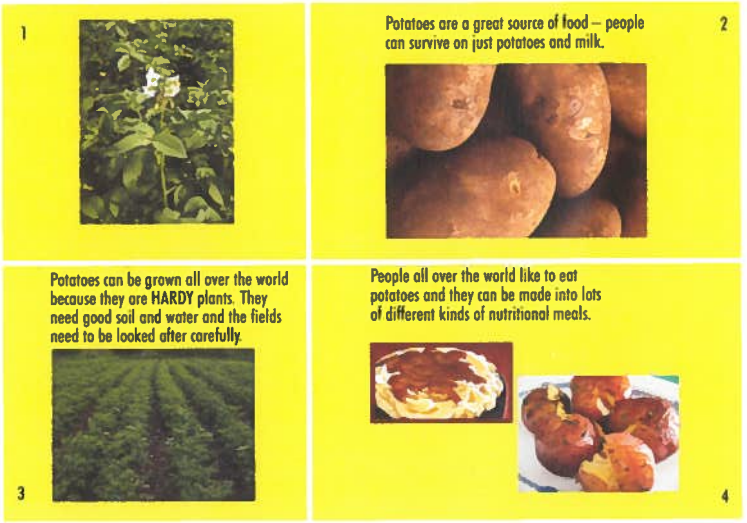


Figure 2 – Example for the potato plant showing the sort of information provided on the cards. Links where children can find more information about these species are given in the teachers' notes.

One of the main purposes of learning in the sciences is to enable children to express opinions and make decisions on social, moral, ethical, economic and environmental issues based upon sound understanding. (Curriculum for Excellence: Sciences - Principles and Practice[1])

This new resource, developed by Marjorie Smith, provides an interesting and topical activity to encourage discussion and decision making. The resource comprises a set of 4 cards for each of 5 animal and plant species (Figure 1). The first card in each set is a picture only and the remaining 3 cards contain increasingly complex information. Because of the design of the activity it is easy to differentiate for those working at different levels e.g. different classes or groups. The scenario (Figure 3) is based around a modern day Noah's Ark story which has links to sustainability, biodiversity and climate change.

In groups, the children decide which two of the species they will take with them on the ship. (Variations are possible e.g. which one would you leave behind?)

To start the activity each group is given the 5 picture cards with no further explanation and asked to make a decision. Even though they may not know what the plants and animals actually are, the children are immediately able to begin to discuss possibilities. They are also instructed to give, and record, reasons for their species. In this case the children chose the bee and the potato plant.

Card 2 for each of the 5 choices is then issued and the groups are asked to review their decisions in the light of the information provided. Teachers would then decide whether to continue with further cards depending on the age/stage of the class or the groups' abilities.

This format lends itself to adaptation to suit other learning contexts. Children could make their own version after research on species or cards could be made for a series of endangered animals and a decision made as to which species should receive help to save it.

The cards and further information can be found at www.science3-18.org.

READ BY THE TEACHER

It is 2099 and water levels are dangerously high. Many towns have disappeared as the sea keeps on rising.

In one week's time, our school will close and we will get onto ships to try and find dry land. We don't know where we are going and if we are ever coming back. Like many schools, we have been asked to take some living creatures with us along with the people. But we cannot take everything and so we have to choose.

This class has the hard job of choosing from a group of five animals and plants.

Figure 3 – A scenario which sets the the scene

References

[1] http://tinyurl.com/princ-and-pract

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