Primary Science & Technology *Bulletin*

Ideas and inspiration for teachers in Primary Schools and S1/S2

> Water - a global experiment with hydrogels
> Windowsill water cycle
> What's new?

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Water - a global experiment with hydrogels

The Royal Society of Chemistry (RSC) [1] has recently launched a worldwide project that Scottish schools can take part in. The project is aimed at 7-14 year olds and asks how much water can a hydrogel hold?

To take part you need some very simple lab (kitchen) equipment (Figure 1) and a source of hydrogels - disposable nappies!

The activity, which is part of the global experiment, involves taking a square from a disposable nappy and pouring small, measured, quantities of water onto it until it can hold no more water. (Figures 2 and 3).

Your results can be uploaded to the RSC's website where you can also view the results from other regions of the world. At the time of writing there were only 4 entries from Scotland. We look forward to seeing your results when they are added to the RSC's map.

There are further experiments you can undertake on this topic and full information, including a short "How to" video are available on the RSC's website [2].

Figure 1 *- Equipment.*

The range of activities could be used as part of the study of several *CfE* Experiences and Outcomes in the Sciences [3].

- By investigating how water can change from one form to another, I can relate my findings to everyday experiences - *SCN 0-05a / SCN 1-05a.*
- I can apply my knowledge of how water changes state to help me understand the processes involved in the water cycle in nature over time - *SCN 2-05a.*
- By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed - *SCN 2-15a.*
- I have contributed to discussions of current scientific news items to help develop my awareness of science - *SCN 1-20a.*
- I can report and comment on current scientific news items to develop my knowledge and understanding of topical science - *SCN 2-20b.*

The activities lend themselves to inclusion in an Interdisciplinary Project. In fact the pre-cursor to the experiment mentioned above involves looking at how much water

Figure 2 *- Pour small measured quantities of water onto the nappy.*

Figure 3 *- The saturated nappy. The hydrogel can hold no more water.*

an equivalent square of towelling fabric (as in an old fashioned nappy) can hold. This links with *CfE* Experiences and Outcomes in Technology [2] and could be a great introduction to looking at how a product has changed over time (TCH 2-01a). The practical activities could also be linked to a study of sustainability (TCH 2-02a) - the number of nappies, and the potential for contamination, in landfill sites is a cause for concern.

References

[1] www.rsc.org/ (accessed 9th April 2015).
[2] www.rsc.org/learn-chemistry/resource/res00001703/water-global-experiment-with-hydrogels (accessed 9th April 2015).
[3] www.educationscotland.gov.uk/learningandteaching/curriculumareas/sciences/eandos/index.asp (accessed 9th April 2015).
[4] www.educationscotland.gov.uk/learningandteaching/curriculumareas/technologies/eandos/index.asp (accessed 9th April 2015).

Windowsill water cycle

An understanding of the water cycle is an important part of the study of the sciences within *CfE* [1].

Figure 1 *- Setting up the experiment.*

Many classroom demonstrations of the water cycle in action are teacher-led and often involve heating water and then allowing the water vapour to condense - producing visible drops of liquid water. While this approach effectively demonstrates the principles of evaporation and condensation it is a difficult leap for learners to make to the water cycle in nature - they know that the sea doesn't boil!

Evaporating large volumes of water in the classroom is difficult so this activity uses a small volume of water, along with a few easily obtained items, to produce an effect that all learners can observe easily and safely.

Cress seeds need water to germinate and this activity uses evaporation and condensation within a closed environment to supply the water, thus providing a model of the water cycle. Cress seeds are used as they are cheap, readily available and germinate easily - making them ideal for classroom activities. Ensure that you obtain fresh stocks of seed each season as germination rates decline after the "sow by date" printed on the packet has passed.

Figure 2 *- The bottles on the windowsill.*

Experiment

You will need to dry out some compost before you begin the experiment - this should be done by spreading out a thin layer of compost on a few sheets of newspaper which have been placed in a tray or shallow container. The experiment aims to show that the water, required by the cress seeds for germination, comes from the separate water source via evaporation and condensation and not from the compost itself.

Gather together two 2 litre plastic bottles, two clean yoghurt pots, dried compost, cress seeds and cling film (Figure 1). You will need to cut the tops off the plastic bottles and tape up the cut ends (we used insulation tape) before learners set up the experiment.

Equal quantities of dried compost are then added to the bottles and half a teaspoon of cress seeds are sprinkled onto the compost of each one. Try to keep the seeds close to the side of the bottle where the water droplets will run down as condensation forms. Place an empty yoghurt pot in one and cover with cling film. This will be the control.

Add water to the second yoghurt pot (about 3⁄4 full) and carefully place onto the soil. It is important that none of the water spills onto the compost. Cover both bottles with cling film and leave both bottles in a warm place - a sunny windowsill is ideal (Figure 2).

The condensed water vapour is clearly visible in the bottle containing the water. After a few days check to see if any of the seeds in the bottles have germinated. Germination rates are not high because it is difficult to rehydrate the soil to any great extent but a few leaves are visible around the side of the bottle (Figure 3). Learners can compare the two bottles - water has reached the compost as evaporated water vapour condenses against the sides of the plastic bottle.

Figure 3 *- Germination has occurred.*

Encouraging close observation (often over a period of time) is one of the key science enquiry skills set out in the Principles and Practice document [3].

This would be an ideal activity for time lapse photography. A free to download and simple to use version was described in SSERC Primary Bulletin 67 [3]. Learners should be able to observe changes in condensation as the temperature fluctuates.

Health and Safety advice

The bottles should be cut by an adult and the edges, which are often sharp and jagged, covered with tape before the children handle the bottles.

For advice on the safe use of seeds and compost refer to SSERC Primary Bulletin 61 "Sow safely with seeds" [4].

CfE links

- By investigating how water can change from one form to another, I can relate my findings to everyday experiences - *SCN 0-05a SCN 1-05a*.
- I can apply my knowledge of how water changes state to help me understand the processes involved in the water cycle in nature over time - *SCN 2-05a*.
- I can help to design experiments to find out what plants need in order to grow and develop. I can observe and record my findings and from what I have learned I can grow healthy plants in school - *SCN 1-03a*.

References

[1] www.educationscotland.gov.uk/learningandteaching/curriculumareas/sciences/eandos/index.asp (accessed 22nd April 2015).

[2] www.educationscotland.gov.uk/learningandteaching/curriculumareas/sciences/principlesandpractice/ (accessed 22nd April 2015).

[3] www.sserc.org.uk/images/Primary_Bulletins/67/PB_67.pdf (accessed 22nd April 2015).

[4] www.sserc.org.uk/images/Primary_Bulletins/61/PB_61.pdf (accessed 22nd April 2015).

What's new?

We are delighted to report that SSERC has received an offer of funding from the Scottish Government to support professional development activities across the primary and secondary sectors.

This will allow us to continue the Primary Cluster Programme and to offer free GLOWMeets via our online platform direct to your school. In addition we have a selection of new courses available for booking via our website.

For further details see www.sserc.org.uk

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