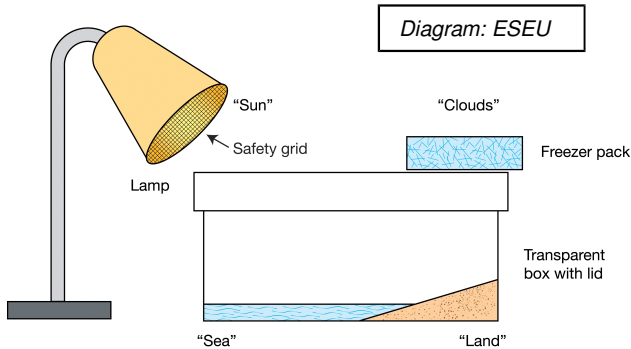


Mini-world water cycle A water cycle demonstration model in a box

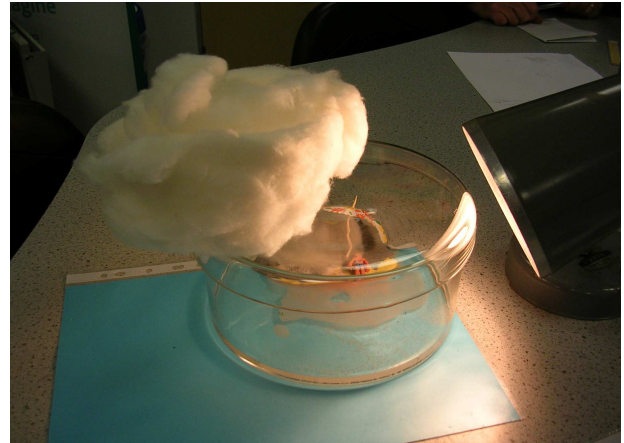
Demonstrate the water cycle in your classroom by setting up the apparatus like this:



Make a sandy 'beach' in the box and add the shallow 'sea'. Switch on the lamp ('Sun') and wait for a few minutes for the water to become warm (or 'cheat' by adding warm water from the kettle). Add the freezer pack to cause the effect of cooling air which will form 'clouds'. After a time, the water droplets that condense on the underside of the box lid beneath the cool 'clouds' grow, and fall to the beach as 'rain'.

So, the water cycle is demonstrated in a box by the 'Sun' causing warming of the 'sea'. This causes increased evaporation of water particles (molecules) from the liquid water surface into the air as water vapour. As the air absorbs more water vapour it becomes humid. Eventually the water condenses from the humid air onto the cooler parts of the box. The freezer pack speeds up this condensation, which begins as droplets, growing into drops. When the drops become large enough, they fall as 'rain'.

Brighten up the mini-world by standing it on blue paper to make the 'sea' blue, adding a Plasticine™ sunbather with a sun shade to the sandy 'beach', and cotton wool to the freezer pack to make fluffy clouds, as in the picture opposite. But beware – the sunbather will have to leave when it starts to rain!



Peter Kennett

Use questions like these to increase the understanding of your pupils:

- Why is there more rain in most tropical areas than in cooler areas? (*more solar energy, greater evaporation*).
- Why is there more evaporation from the sea than from the land? (*greater surface area of water*).
- How can water evaporated over the sea cause it to rain on the land? (*humid water from over the sea is moved across the land by air currents i.e. wind*).
- How does water rained on the land return to the sea? (*by flowing downhill in rivers and by flowing underground through soil and rock*).
- Does it only rain on the land or can it rain on the sea as well? (*it rains on both*).
- Which parts of the water cycle can be seen in our school area? (*all of them*).

The back up

Title: Mini-world water cycle.

Subtitle: A water cycle demonstration model in a box

Topic: A demonstration water cycle in a transparent box, using materials readily available in the classroom.

Age range of pupils: 5 – 11 years

Time needed to complete activity: 15 mins

Pupil learning outcomes: Pupils can:

- describe how warming water increases evaporation;
- describe how cooling humid air causes condensation;
- point out areas of evaporation and condensation in the model;
- link these to examples of evaporation and condensation locally and globally.

Context:

Materials which are readily available in the classroom are used to model the water cycle in a mini-world, which is then used as a context for discussion with the pupils about the processes involved.

Following up the activity:

Ask pupils how the water cycling in the model could be speeded up (*warmer lamp, greater 'sea' area, colder freezer pack*) or slowed down (*the opposite*). Ask them how the model could be made more realistic (*there are many ways, including: modelling the 'land' to make hills and river channels; planting vegetation eg. cress; adding salt to the 'sea'; adding fish to the 'sea' or animals to the 'land'; etc.*)

Underlying principles:

- The Sun warms the Earth.
- Water evaporates from water surfaces, the warmer the water the greater the evaporation rate.
- Air contains evaporated water as molecules of invisible water vapour; the more water vapour, the greater the humidity.
- When humid air is cooled, water condenses to form water droplets.
- As condensation continues, water droplets can grow until they become heavy enough to fall – as rain.
- The main elements of the water cycle are evaporation, movement of air carrying water vapour, condensation to form precipitation (rain, snow, etc) and, following precipitation on land, flow of water over or through the soil/rocks.

Thinking skill development:

The linking of the model to reality is a bridging skill. Responding to the questions involves elements of construction, cognitive conflict and metacognition.

Resource list:

- lamp with a hot bulb and protective grill (see 'safety grid' in the diagram)
- transparent plastic box with a tightly fitting lid; a box suitable for the freezer is ideal
- sand for the 'land'
- water
- frozen freezer block
- optional – items to enhance the mini-world model (see page 1)

Useful links:

See the other Earthlearningidea 'watery' activities at:
http://www.earthlearningidea.com/home/Teaching_strategies.html

Source: Devised at an Earth Science Education Unit working weekend and published in the ESEU workshop booklet, 'How the Earth Works in your Classroom' as 'Make your own rain'. Adapted and refined by Sarah Lewis.

The progression of thinking skills shown by the Earthlearningidea Water Cycle activities

Earthlearningidea	Strategies and skills developed
Changing state – transforming water: practical activities to change the state of water; solid, liquid, gas	Demonstrations of the change of state of water in a tactile way, enabling language skill development
Mini-world water cycle: a water cycle demonstration model in a box	Demonstration of key water cycle processes in a simple model, allowing bridging to the more abstract water cycle and the development of higher level thinking skills through discussion
Water cycle world: a discussion activity on the natural water transformations on Earth	Extended discussion about the different elements of the water cycle and the many different products of the cycle
'Tagging' water molecules – to explore the water cycle: a thought experiment to investigate the water cycle	A 'thought experiment' to encourage creativity and imagination in pupils in the context of the water cycle
Cycling water and heat in the lab – and the globe: demonstrating the water cycle, latent heat and global energy transfer	A lab demonstration of the water cycle, extended to promote higher level thinking skills and an understanding of the abstract process of latent heat transfer

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