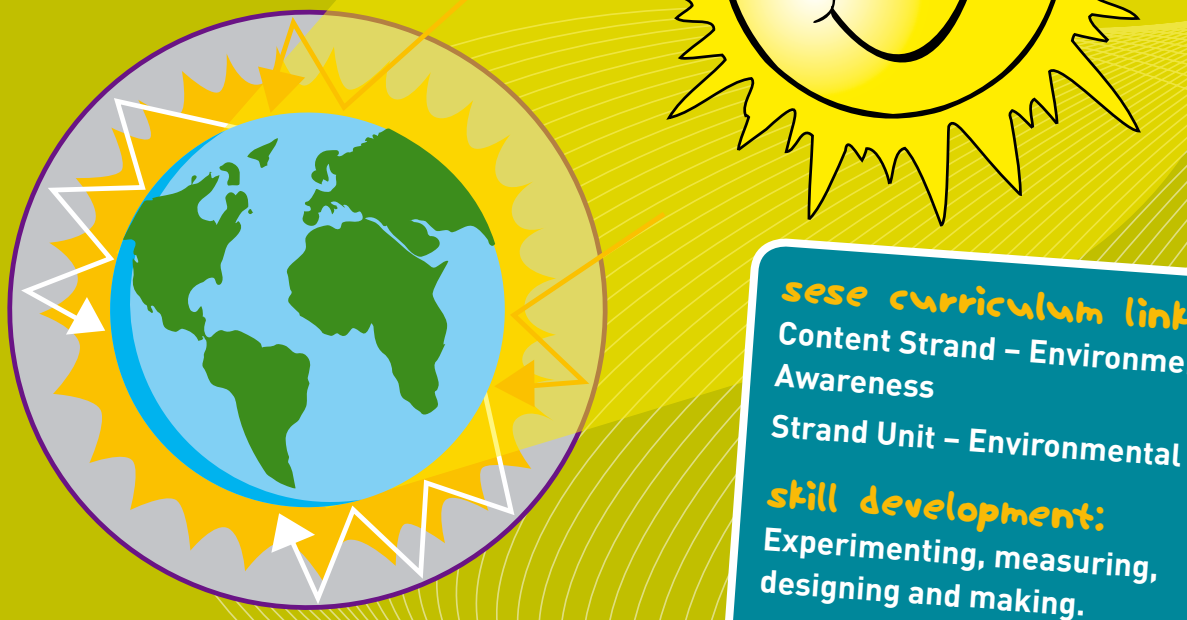
seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Hot House

key message: burning fossil fuels creates a blanket of carbon dioxide near the earth which traps heat from the sun and is causing global warming.



sese curriculum link:

Content Strand – Environmental Awareness

Strand Unit – Environmental Awareness

skill development:

Experimenting, measuring, designing and making.

integration opportunities:

SESE: Geography – Natural environment, Weather

SESE: Science – Materials

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Key Message: Burning fossil fuels creates a blanket of carbon dioxide near the earth; this blanket of carbon dioxide traps heat from the sun and other greenhouse gases, is causing global warming which could have drastic effects on our planet.

Today we are going to explore how the Greenhouse effect works.

- How can you trap heat?How do humans trap the heat of their own body?
- Do you have a greenhouse? Or a conservatory? What are they made of? *Glass, plastic* What are they for? *Growing young tender plants that need heat as well as light*
- What does the glass/plastic allow in? *Heat, light*
- What do you call a material that you can see through? *Transparent*
- What do you call a material that allows light through but you cannot see through it? *Translucent.*
- Does the greenhouse let out all the heat that comes into it? *Not all, it traps some of the heat*
- Discussion on 'trapping' things i.e. things getting into something but not being able to get out again, e.g. trapping fish in a net, insects in a pooter, a mousetrap....
- Why should you not leave a dog in a parked car on a sunny day? *Because the car traps the heat from the sun and the dog, with its furry coat, would get very hot and perhaps die.*

Background

Burning fossil fuels produces carbon dioxide, sulphur dioxide and methane. These gases build up around the earth and, although they allow the strong direct rays of the sun to get through to the earth, they prevent many of the weaker rays of sun that are reflected off the earth's surface from escaping back out. Much of the sun's heat gets trapped near the earth, just as a greenhouse works - the heat gets in but cannot get out!

This is known as global warming or the 'greenhouse effect'. We often hear that scientists are very concerned about the damage that may be caused including extreme weather conditions such as storms, coastal erosion, flooding, droughts and more deserts.

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How can we investigate the sun's heat being trapped by a layer of gases?

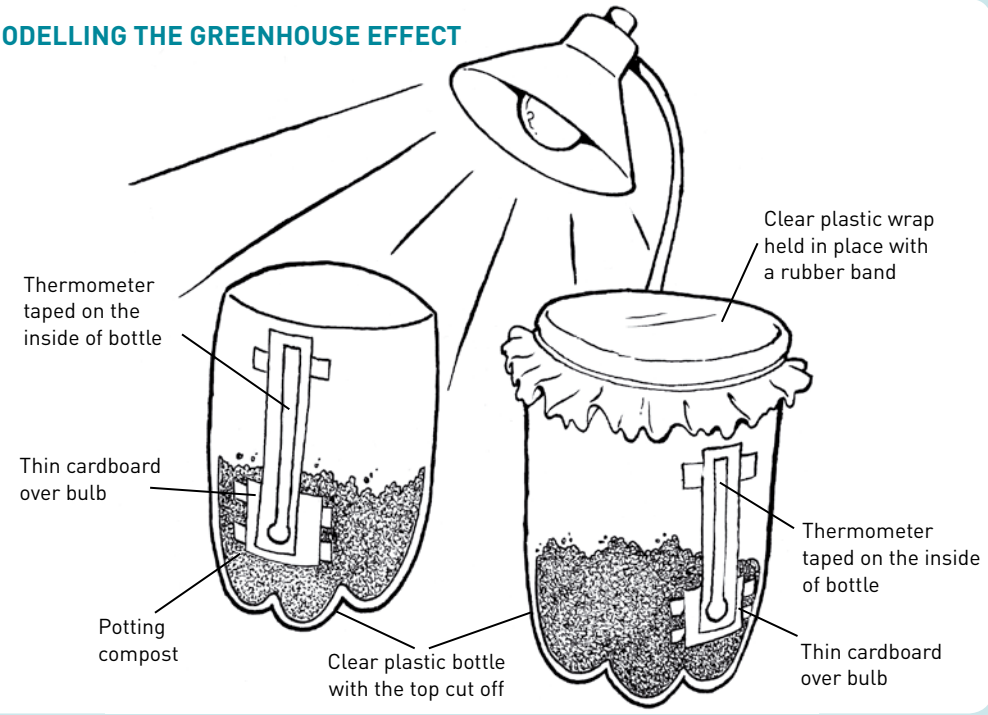
You will need

- 2 plastic 2 litre bottles
- 3 cups compost
- clingfilm
- 2 thermometers
  (alcohol ones, mercury is not recommended it is poisonous)
- desk lamp which can be positioned to face shining downwards
- thin cardboard
- masking tape
- 4 tblsp lemon juice

Steps

1. Cut the top off the plastic bottles (see diagram).
2. Tape the thermometers to the inside of the bottles.
3. Tape some cardboard over the bulb of the thermometer (to block the direct heat from the 100W bulb).
4. Put about 1½ cups of potting compost into each bottle.
5. Cover one of the bottles with the clear plastic and secure with the rubber band.
6. Put the bottles on a table about 10 cm apart.
7. Take the temperature in each of the two bottles (it should be the same).
8. Place the lamp shining down on both bottles.
9. Turn it on and make a note of the temperature over about 10 minutes.

MODELLING THE GREENHOUSE EFFECT



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Discussion

- Ask the children to predict which bottle will heat up the most. *The covered bottle will probably heat up more than the open one.*
- What did the children find out? Which bottle heated up more? Ask the children to comment on the model that they made. Are there ways in which it could be improved?

Did you know?

Scientists reckon that we will have much more extreme climate conditions if we go on using energy the way we are using it today. They predict more heat waves, droughts that lead to more deserts, flooding, melting of ice at the poles and more storms. A low country like Bangladesh would probably be flooded, so could the South of England and the centre of Dublin, i.e. anywhere low.

Climate change will hit the poorest people the hardest. The worst effects of climate change are felt by those who have contributed least to its causes:

- USA – 5% of the world's population but use 29% of the world's energy
- Africa – 12% of the world's population but only use 3% of the world's energy

In the last fifteen years the United Nations has been trying to reduce greenhouse gas emissions, by having a number of very important meetings:

- 1992 – Earth Summit in Rio de Janeiro
- 1997 – Meeting in Japan, resulting in the Kyoto Protocol
- 2009 – Copenhagen meeting to renew the Kyoto Protocol

Many countries signed up to the Kyoto Protocol in 1997 and agreed to reduce their emissions. The Copenhagen Accord, a follow up agreement was drafted in December 2009 and signed by 141 countries, representing 87% of global emissions.

Safety

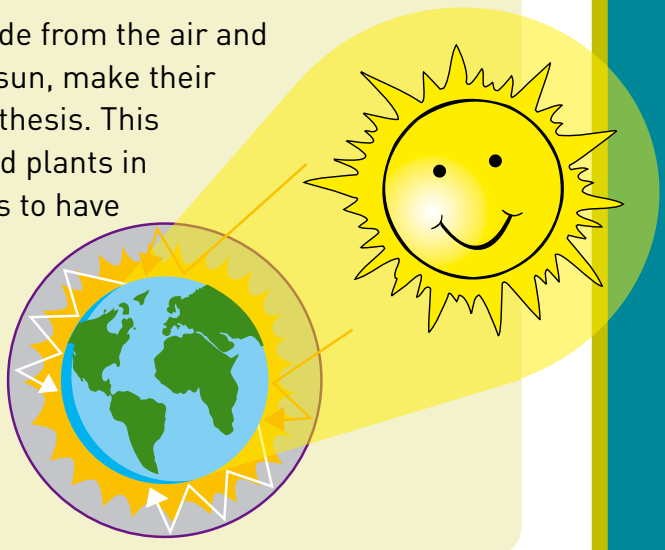
Care with the lamp – it may get hot

Extension Activities

The children could be asked if they can think of any other ways of trapping heat, e.g.

HEAT	BROUGHT IN BY:	TRAPPED BY:
Heat of body	Food	Clothes
House	Oil, gas, coal	Attic insulation, etc.
Hot water cylinder	Electricity	Lagging jacket
Earth	Sun	Carbon Dioxide

- Find out more about carbon dioxide gas. What is it used for?
- *Fire extinguishers - the fire goes out because things cannot burn in carbon dioxide, they need oxygen. How many fire extinguishers are there in the school? Carefully read the labels to see what they contain, but do not touch them. Do they contain carbon dioxide - it could be written as CO2?*
- *Fizzy drinks – the gas in fizzy drinks is carbon dioxide; it is dissolved under high pressure, but appears as bubbles when the bottle is opened.*
- Why is baking powder put in some cakes? *When the cake is cooked the baking powder gives off carbon dioxide gas which makes the cake rise.*
- What will the greenhouse effect have on our climate? What will happen the ice caps? What effect will this have on low lying countries?
- Green plants take in carbon dioxide from the air and with the help of energy from the sun, make their own food. This is called photosynthesis. This is why we need plenty of trees and plants in the world. Why is it good for cities to have parks?



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Useful Websites

www.seai.ie/schools

www.primaryscience.ie/activities_introduction.php

www.epa.ie/researchandeducation/education/primary/

www.askaboutireland.ie Eco Detective Resource for Primary Schools

www.coolkidsforacoolclimate.com/

www.energyquest.ca.gov/index.html

www.eere.energy.gov.kids

www.learn-energy.net/education/

www.suschool.org.uk