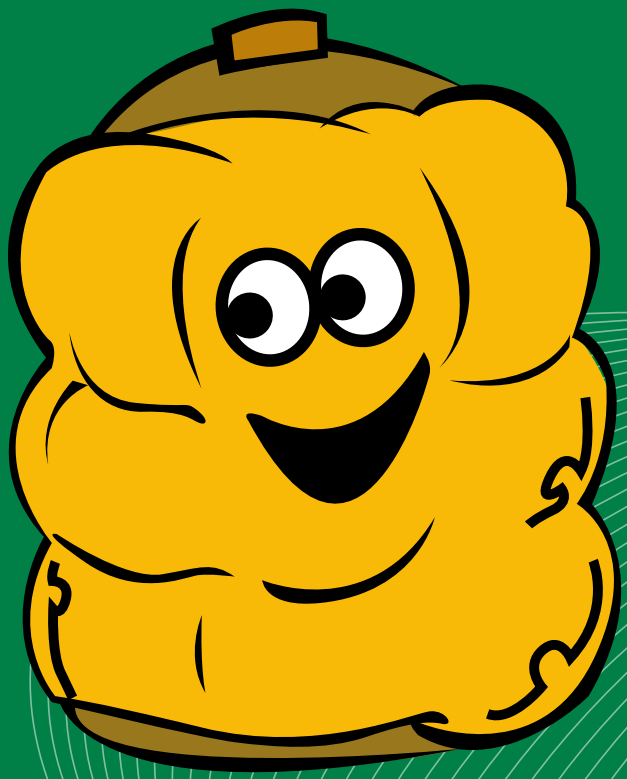
seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Don't Lose Your Cool Investigating Hot and Cold

key message: heat flows from warmer to cooler things. insulators do not let heat pass through easily.



sese curriculum link:

Content Strand – Environmental Awareness and Care

Strand Unit – Environmental Awareness

skill development:

Investigating, experimenting, observing, recording and analysing.

integration opportunities:

SESE: Geography: Strand Human Environments: People living and working in the local area and in a contrasting part of Ireland: *common building materials and their relationship to the environment.*

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Key Message: Heat flows from warmer to cooler things. Insulators do not let heat pass through them easily, therefore they will keep hot things hot and cold things cold.

Before you start

Today we are going to try to find out about materials that keep us warm when we are cold and cool when we are too warm.

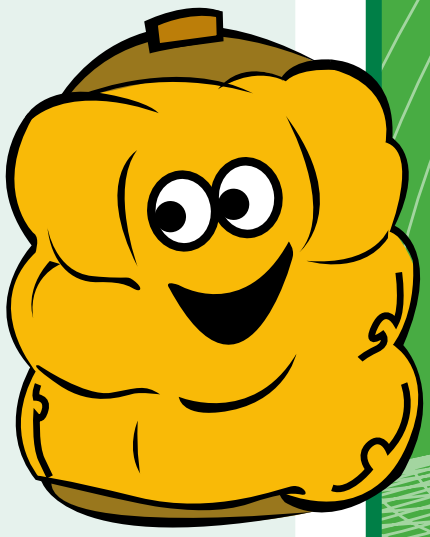
Some children may think that warm clothes make you warmer by making more heat, and they will expect the woolly material to generate heat and melt the ice faster.

- If your freezer was broken how would you keep your ice pop cold?
- What happens to the snowman when the sun comes out?
- What is melting? What does snow turn into? *A solid becoming a liquid when heated.*
- If you put a coat on a snowman would it keep him warm and make him melt faster or keep him cold and make him last longer.
- Discuss different parts of the world and their climates. What kind of clothes do people wear in these countries?
- Discuss how different materials feel to touch.

Background

Heat flows from a warmer object to a colder one. Insulators are any materials which are used to slow this movement of heat. The cheapest insulator of all is all around us. It is **AIR**!

Still or stagnant air does not allow much heat to pass through it. Air tends to move around, so in order for it to be an insulator it has to be kept still by trapping it within materials. The best insulators contain millions of tiny air spaces which do not allow heat through them. So the heat is 'kept in' or 'kept out'.



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How can we find out what materials work best as insulators?

You will need

Various materials for testing temperature eg. piece of carpet, a stone, metal spoon, wooden spoon (one of each per group)

Ice cubes

Various materials to wrap the ice cubes eg. newspaper, bubble wrap, woollen item, cotton, aluminium or tin foil, cotton wool

Steps

1. Start by dividing the children into pairs or groups of 3 or 4.
2. Give out the materials for testing temperature. Ask the children to tell you which is colder, the piece of carpet or the stone. Even though they are both at the same room temperature the carpet will feel warmer because it's an insulator.
3. Ask the children to hold a wooden spoon to one cheek and a metal spoon to the other. Even though the two spoons are at the same room temperature the metal spoon will feel colder because metal is a conductor of heat i.e. not an insulator. It allows the heat of your body to flow out through it, leaving you feeling cold. Wood is an insulator so the opposite happens.
4. Give out the materials for wrapping the ice cubes, one material per group. Groups agree on how many layers to wrap the ice in and they wrap it up. One ice cube should be left unwrapped as a "control".
5. The wrapped up cubes should be left on the desks for some time (how long depends on the temperature of the room, over break might be a good time). After an agreed time the children unwrap the ice and compare the sizes of the cubes.
6. Children can use the recording sheets to record their findings. Why not carry out the activity at the end of the lesson plan?

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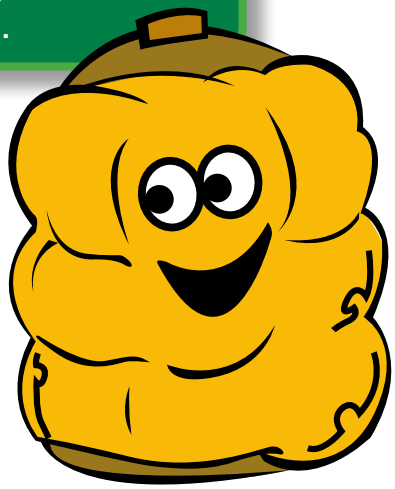
Discussion

- Which material kept the ice cubes frozen for the longest? Compare the evidence with their predictions.
  The children may be surprised to find that the materials that kept the ice cubes cold longest are the same materials that they would wrap up something in to keep it warm.
- What was it about the material did they think kept the ice colder?
- What was it about the material in which the ice melted the fastest?
- A good insulator reduces the heat flowing from warm areas to cold areas and cold areas to warm areas.

Did you know?

Frank Epperson, from California, invented the ice lolly in 1905 when he was 11 years old.

Polar bears are so well protected from the freezing cold in the Arctic (with their two layers of fur and a layer of blubber up to 11 cms thick) that they have more problems with overheating (when they try to run) than they do with the cold!



Answers to activity at end of lesson plan – Wasting energy in the home

- Dripping shower
- Hot water in basin not being used
- Lights left on
- Radio and computer left on in bedroom
- Curtains open when they could be used to insulate the rooms
- Windows open and letting out heat
- Door open and letting out heat
- Television left on in sitting room

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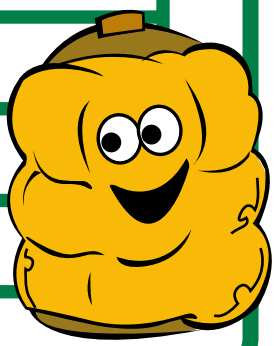
recording sheet - photocopy and use

What I Think Will Happen

Material	Good insulator	Bad insulator
Cotton		



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recording sheet - photocopy and use

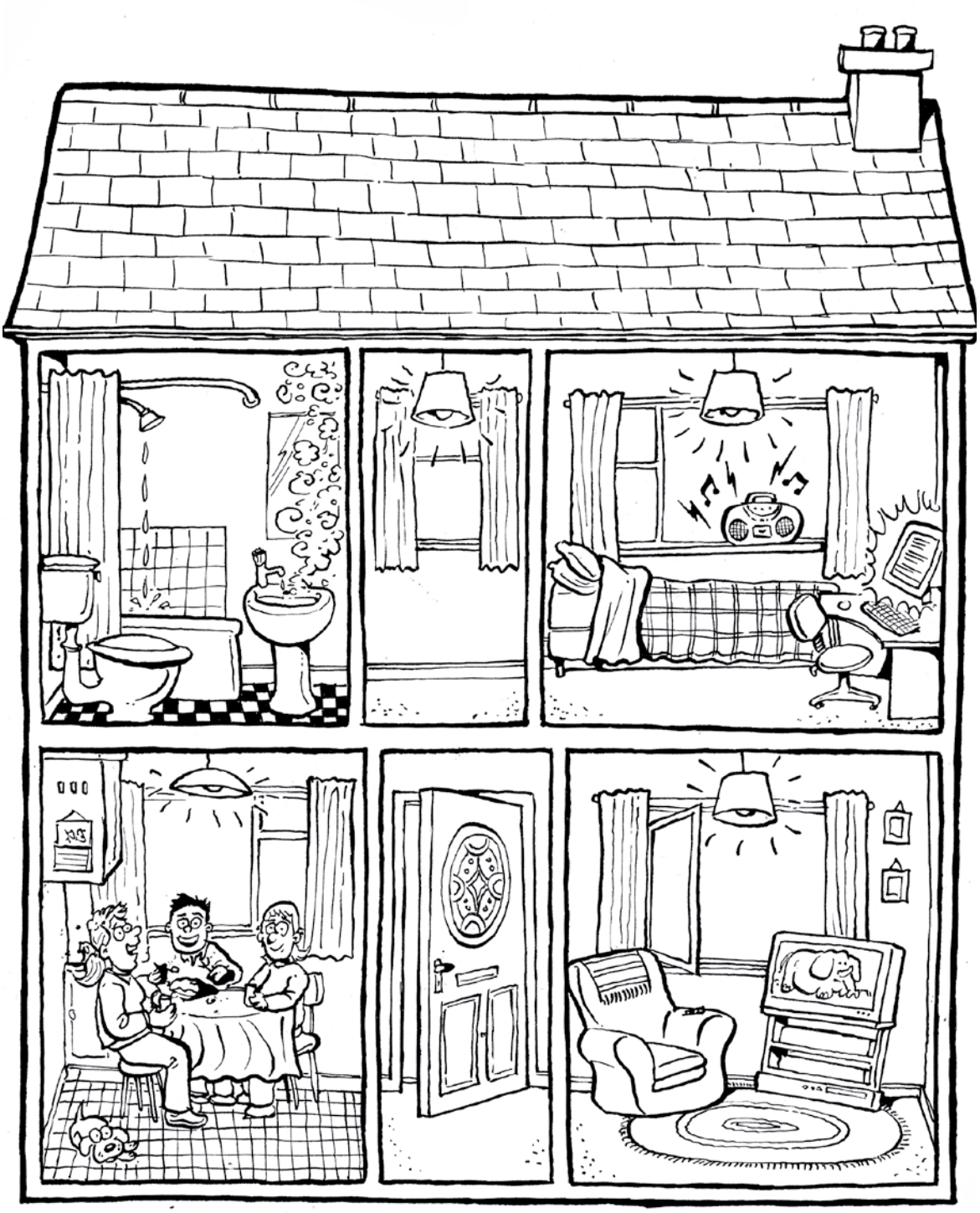
What Actually Happened

Material	Time	Good insulator	Bad insulator
Cotton			

photocopy and use

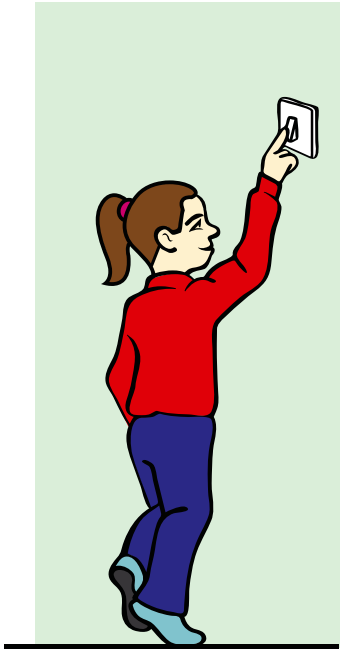
Wasting Energy in the Home

There are at least eight ways in which energy is being wasted in the house. Can you spot each of them?



photocopy and use

Ways to Save Energy in the Home



Things you can do...

Don't leave the TV on standby, turn it off at the power button.

When it's bright, turn off the lights.

When you've charged your phone, plug it out. It only takes 3 hours to charge a phone, not overnight.

Have a shower instead of a bath, it uses less hot water.

Keep doors and windows closed when it's cold outside.

Close the curtains in cold weather to help keep the heat in.

Recycle your cans, bottles and paper because it saves energy.

Get the adults to save energy too...

When it's dry outside, use the sun and wind to dry your clothes instead of a tumble dryer.

Only boil as much water as you need.

Use energy efficient light bulbs (CFLs), they use a lot less electricity and last 10 times longer.

Fit a lagging jacket on the hot water tank or cylinder and the water will stay hot for longer.

Insulate your attic and save up to 20% on your heating bills.

Draught proof the doors and windows of a house.

Use thermostat controls on the radiators so that you can increase or lower the temperature.

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