

A resource for teaching
sustainable energy in Primary Schools

3rd and 4th Class



A resource for teachers

This resource will help you bring the topic of sustainable energy into the classroom in the context of the Primary Science Curriculum and the Green-Schools programme. It will help children learn about energy in a real world way, exploring how and why as a society we need to develop new ways to meet our energy needs. This resource makes teaching energy engaging as children see it as relevant to their own lives and future well-being. As children learn about sustainability, they will develop behaviours that benefit them and wider society. Overall, the resource will help children gain an understanding of our current energy challenges and potential future solutions.

How to use this resource?

There are five chapters in this booklet covering the topic of sustainable energy. Each chapter has the following structure:

- Aims
- Overview
- Working scientifically skills
- Primary Science curriculum link
- Resources
- Main body of lesson
- Extension

All chapters have supporting interactive whiteboard activities and PowerPoint slides (for those teachers who do not have access to an IWB) and photocopiable master sheets to help learning. These can be accessed and downloaded at www.seai.ie/teaching-sustainability

Other resources from SEAI for schools

- All teaching resources are on our website www.seai.ie/teaching-sustainability
- If you would like hard copy resources e-mail schools@seai.ie
- We can visit your school and run workshops for pupils and teachers. See www.seai.ie/teaching-sustainability/primary-school/ for more details and bookings.
- Your pupils can enter SEAI's One Good Idea competition to showcase their energy projects www.seai.ie/onegoodidea
- The **e** icon is used in this booklet to identify lessons that involve pupils in saving energy at school, go to this website for resources www.energyineducation.ie

SEAI supporting Schools

SEAI works with the public, businesses, communities, schools and government to achieve a cleaner energy future. We run campaigns and initiatives to increase awareness on sustainable energy and change behaviours. Children are key to this sustainable energy transition.



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This programme was researched and developed by the School of STEM Education, Innovation and Global Studies and the Centre for the Advancement for STEM Teaching and Learning (CASTeL) in DCU Institute of Education.

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e Look for the this icon to find lessons that can be used to involve pupils in energy saving in school in conjunction with the Energy in Education programme. www.energyineducation.ie

Chapter 1: Introduction to Energy

Aims

The aim of this chapter is for children to learn how our sun acts as a source of energy.

Overview of Chapter



The lessons in this chapter introduce the sun's role as a source of energy for all life on the planet. The children discuss the factors involved in plant growth and learn how simple food chains and food webs are formed.

Teacher note: Before starting this chapter the strand unit, Plant and Animal Life, should be covered. This will enable the child to:

- Observe, identify and investigate plants and animals that live in their local environment.
- Appreciate that animals depend on plants and indirectly on the sun for food.
- Discuss simple food chains.

Working Scientifically Skills

Through discussing, engaging with and reflecting on the investigations in this chapter the children will be applying and developing the following scientific skills:

- Observing
- Predicting
- Investigating and experimenting
- Estimating and measuring
- Analysing (Recording patterns)
- Recording and communicating

Primary Science Curriculum link

Strand unit: Plants and animals

Lesson 1 – What does a plant need to grow?

Resources

IWB 1 / PowerPoint 1: Our environment

IWB 2 / PowerPoint 2: What does a plant need to grow?

Activity type: Discussion

Use **IWB 1 activities** to discuss different environments and which environment is most suitable for growing plants. If you do not have access to an IWB use **PowerPoint 1** to aid discussion.

Use **IWB 2 activities** to hold a whole class discussion on the factors that influence plant growth. If you do not have access to an IWB use **PowerPoint 2** to aid discussion.

After the whole class discussion divide the class into groups. Ask them to select four factors that they perceive to be the most important for the growth of plants. Illustrations on **IWB 2 / PowerPoint 2** can be used. Each group reports back to the whole class giving reasons for their choices. Record the children's choices.

Lesson 2 – The sun as a source of energy: food chains and food webs

Resources

IWB 3 / PowerPoint 3: Energy transfer in the environment

PCM 1-9: Food chains and food webs: pictures of animals and plants

Ball of wool, Tape to attach pictures to clothing, Space for the class to form a large circle

Activity type: Discussion

Teacher note: In this lesson children will learn how energy is transferred from the sun to all life on the planet using a game that explores food webs and food chains.

Children will

- 1 Construct a food chain (using one producer and three consumers) and explain how energy flows through the chain.
- 2 Explain how all living things depend directly or indirectly on green plants for food.
- 3 Use pictures and arrows to create a food web that includes: the sun, green plants, herbivores, omnivores, and carnivores.

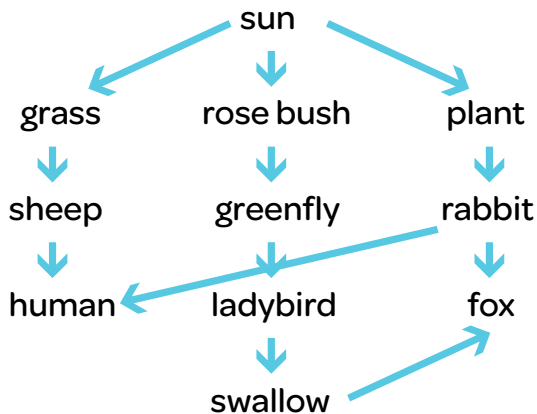
Example of food chains:

Chain 1 sun → grass → sheep → human

Chain 2 sun → rose bush → greenfly → ladybird → bird

Chain 3 sun → grass → rabbit → fox

Example of a food web:



How to run the game

- 1 The children tape a picture to each of their chests.
- 2 Tell the children that they will now make a food web. Have them stand in a circle and introduce themselves as the plant (*producer*) or animal (*consumer*) they represent. Only one child should have the picture of the sun; that child should stand in the centre.
- 3 Before beginning the game using the instructions below, ask your class the following question:
 - Where would your animal or plant get their energy from?

Introduce a ball of wool and explain that it represents sunbeams or energy from the sun. Ask the child with the picture of the sun to hold the end of the wool tightly and throw the ball to someone who can use that energy (*a green plant*). When a child with a picture of a green plant catches the ball of wool, he or she should hold the wool, so that they are connected to the sun, and throw the ball to someone who could use their energy, for example, a sheep. Once the wool reaches a carnivore (*an animal that only eats meat e.g. falcon*) or an omnivore (*an animal that eats both plants and animals e.g. fox, badger, human*) cut the wool and start again at the sun. This will represent one food chain. Repeat the process again until everyone in the class has been included in more than one food chain. Ask the class to gently put the wool on the ground, take a step back and observe the pattern the wool has made. The chains should be interconnected making the pattern of a web.

Questions to promote discussion

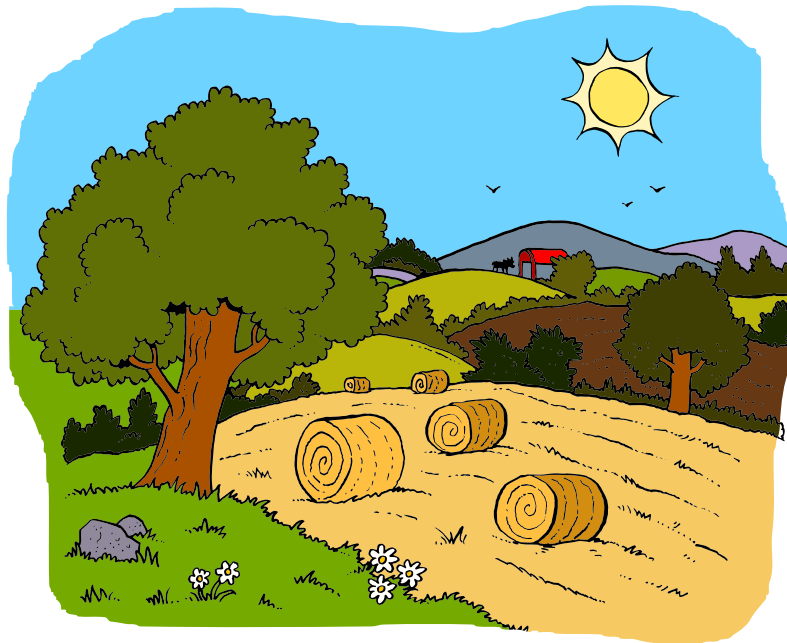
- 1 Who is part of most chains? (*Sun and green plants*)
- 2 What would happen if all the green plants died? (*Nothing else in the food web could survive*)

Extension

The children identify food chains from other ecosystems (e.g. forest, wetland, marine, etc.) and design pictures of the plants and animals from that ecosystem, using arrows to indicate the flow of energy. They could use the internet to help them with this activity.

Children could conduct some research on the plant or animal they represented in the food web activity. They could write a report, tell a story, or make an illustration about the plant or animal to share with the class.

Investigations from the book, **The Energy File: Make a Wormery (page 16) and Composting (page 19)** to see part of a food web in action.



CHAPTER 2: Energy in our Lives

Aim

The aim of this chapter is for children to investigate and test the effect of the sun's energy.

Overview of Chapter

The lessons in this chapter explore further the sun's role as a source of energy. Children are encouraged to investigate the effect of the sun's energy on plants through a fair test investigation and a design and make activity.

Working Scientifically Skills



Through discussing, engaging with and reflecting on the investigations in this chapter the children will be applying and developing the following scientific and designing and making skills:

- Observing
- Predicting
- Investigating and experimenting
- Estimating and measuring
- Analysing (Interpreting)
- Recording and communicating
- Designing and making: exploring, planning, making and evaluating

Primary Science Curriculum link

Strand unit: Plants and animals

Lesson 1 – Do plants need sunlight to grow?

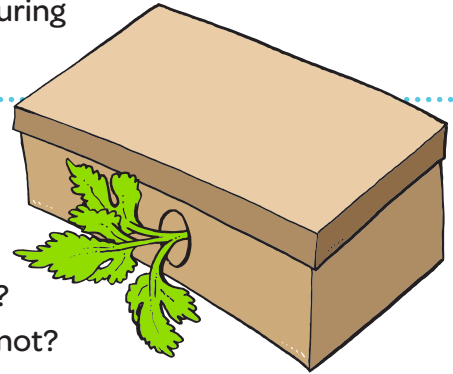
Lesson link

Before starting this chapter teachers are advised to complete Chapter 1 of this programme with their class

Resources

IWB 4 / PowerPoint 4: Do plants need sunlight to grow?

6 quick growing plants (e.g. pea, bean, lettuce or parsley), 5 shoe boxes, scissors, digital camera, measuring jug (for watering the plants).



Activity type: Investigation

Finding out children's ideas

- 1 Do you think plants need light to grow? Why?
- 2 What do you think would happen if a plant got no light?
- 3 Do you think plants grow towards the light? Why/ why not?
- 4 Look at the equipment we have today: how do you think we could use it to find out whether or not a plant grows towards the light?

Investigation question: "Do plants grow towards light?"

Setting up the investigation (see **IWB 4 / PowerPoint 4** for illustrations)

- 1 Show the children the 5 plants. Number each pot and take a photograph of each.
- 2 Place pot 1 under a shoe box with no holes.
- 3 Place pot 2 under a shoe box with a large hole on top.
- 4 Place pot 3 under a shoe box with a large hole on the left hand side.
- 5 Place pot 4 under a shoe box with a large hole on the right hand side.
- 6 Place pot 5 under a shoe box with a large hole at the front.
- 7 Place pot 6 beside the others with no box.

Ask the children to predict what they think will happen to each of the plants. Record their predictions.

Water each plant daily using the same amount of water.

After 10 days children take the boxes off all four pots and carefully observe each plant.

Encourage the children to record their observations by drawing the pots or taking photographs.

Questions to promote discussion

- 1 Describe what happened to the plants in each pot.
- 2 Why do you think this happened?
- 3 What does this tell us about plants?
- 4 Compare what happened to the plants in each box with the plant that was not in a box.

- 5 Do you think sunlight is important for plants? Why?
- 6 What kind of energy do plants use? (*sun*)
- 7 Is this renewable or non-renewable energy? (*renewable*) Why?
- 8 Encourage the children to do some research about why plants need sunlight.

Lesson 2 – Design and make a greenhouse

Resources

IWB 5 / PowerPoint 5: Different kinds of greenhouses

Some materials that could be used to make the greenhouse: Different coloured plastic bottles, containers (like those for pre-packed salads, fruit etc), cellophane plastic bags (zip-loc) and coloured / white plastic bags, scissors, cellotape, twine, blu-tack, lollipop sticks, dowel.

Activity type: Design and make

Exploring

Show the children the pictures of greenhouses (IWB 5 / PowerPoint 5). Hold a classroom discussion on the structure and functions of a greenhouse.

Questions to promote discussion

- 1 What do you see in the pictures?
- 2 Do you know what they are?
- 3 What are they used for?
- 4 Why do you think gardeners plant things in greenhouses?
- 5 How do you think greenhouses help plants to grow?
- 6 What are they made from?
- 7 How do you think the sun gets into the greenhouse?

Tell the children that they are going to design and make their own small, table top greenhouses. Show the children the materials that are available to them and discuss the criteria that their designs must meet.

Some suggestions for criteria:

- It must be made from recyclable materials.
- It must be at least 30cm in height.
- It must be able to stand by itself.



Planning and making

After the whole class discussion on materials and criteria, the children work in small groups. They discuss their designs and make detailed drawings of them. They then make their greenhouses.

Evaluating

Each group evaluates their designs.

Questions to promote discussion

- 1 How did you make your greenhouse?
- 2 Did you stick to your original design?
- 3 How did you change it?
- 4 If you were to make this again is there anything you would do differently?
- 5 What aspect of your design do you like most?

Lesson 3 – How can we be sure energy is coming from the sun?

Lesson link

Junior and Senior Infants Programme Chapter 4: All lessons

1st and 2nd Class Programme Chapter 4: All lessons

Resources

Thermometers (1 per group), Piece of A4 paper (1 per group)

PCM 10: Planning your investigation

PCM 11: Recording your investigation

Teacher note: This activity needs to be conducted on a sunny day or an overcast day (not intermittent cloud).

Safety note: Remind the children of the dangers of looking directly at the sun.

Activity type: Discussion

Questions to promote discussion

- 1 How do we know that the sun is a source of energy?
- 2 Could this energy be coming from somewhere else?
- 3 What do we observe about the sun? What can we see? (*day/night*) What can we feel? (*we observe that the sun gives us heat and light because we can see light and we can feel heat*).

- 4 How could we test and confirm our observation that heat comes from the sun?
How will we make sure this test is fair?
- 5 What equipment would you use to measure heat energy?

Activity type: Investigation

Investigation question: “How do we know that the sun gives off heat energy?”

In groups the children discuss how they could measure the heat energy from the sun using thermometers and a white sheet of paper. They discuss and record their plans on their planning sheets (PCM 10) and carry out their investigations. Emphasise the importance of ensuring a fair test and of knowing how they are going to record their results. They can record their results on recording sheets (PCM 11).

One possible way to carry out the investigation is the following:

- 1 Place a thermometer in the sunlight. Discuss the placement of the thermometer in terms of ensuring the test is fair: e.g. standalone spot if possible, not directly touching the ground or a building (*this might give off heat and give an inaccurate reading*), in direct sunlight.
- 2 Leave the thermometer until the temperature stabilises. Record the temperature.
- 3 Think about how they could change the conditions to see if the sun gives out heat. What factors should stay the same to make the test fair, what could they change? For example: place a piece of paper over the thermometer.
- 4 Leave the thermometer until the temperature stabilises. Record the temperature.
- 5 Remove the piece of paper.
- 6 Leave the thermometer until the temperature stabilises. Record the temperature.

Discuss how the class will record their results. Here is one option for a table:

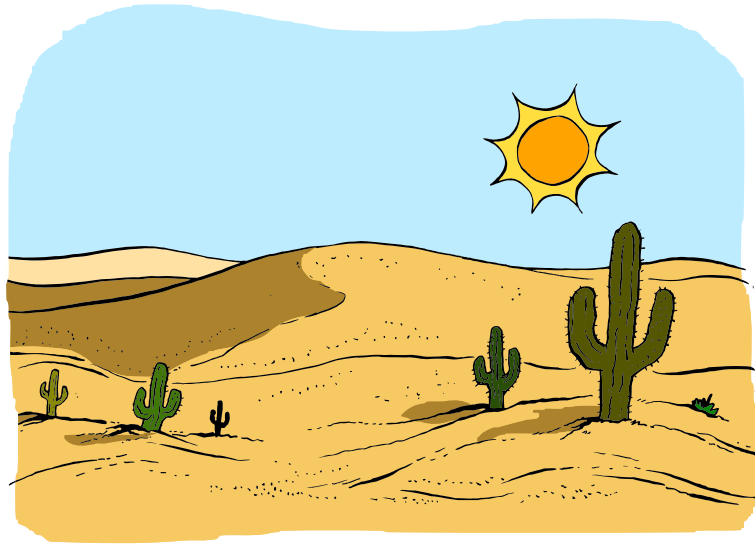
Initial temperature	Covered temperature	Uncovered temperature

Discuss the investigation and the results.

Questions to promote discussion

- 1 What did we observe throughout the investigation?
The process started with an observation that we feel heat and suspect it comes from the sun but as scientists we question this – and test what we observe.
- 2 How did we test our starting observation?
We used a thermometer as a tool to measure heat. We devised a test that kept the thermometer in the same place and the same conditions but changed how much sunlight shone on the thermometer. We blocked the light and heat from the sun by covering the thermometer with the paper. We recorded that the temperature on the thermometer changed before and after taking the paper off; this gives us evidence that the sun produces heat energy.

- 3 How does the sun affect us?
- 4 Why is the sun useful?
- 5 Can the sun be harmful?
- 6 In what way is the sun's energy harmful?
- 7 List two ways to protect yourself from the sun (*wear sunscreen and sunglasses*).



CHAPTER 3: Weather and Climate Change

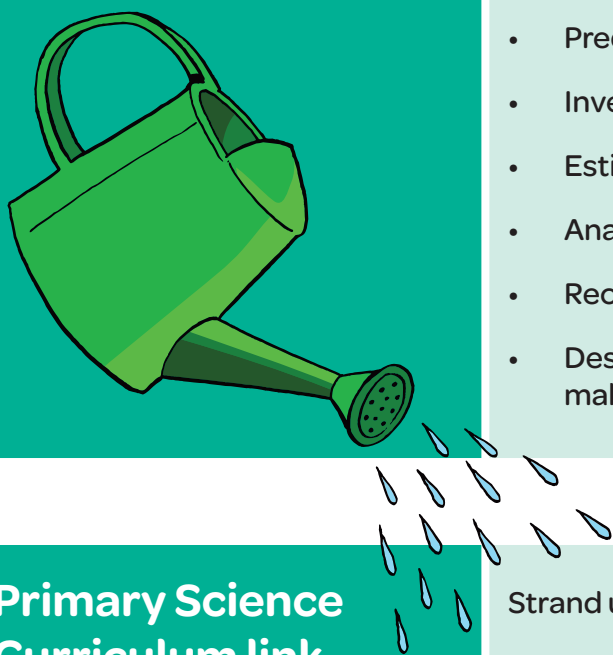
Aim

The aim of this chapter is to introduce children to the concepts of weather and climate.

Overview of Chapter

Children discuss the term weather and record weather data over 5 days. Children learn about climate and the difference between climate and weather. They are then introduced to the concept of climate change.

Working Scientifically Skills



Through discussing, engaging with and reflecting on the investigations in this chapter the children will be applying and developing the following scientific and designing and making skills:

- Observing
- Predicting
- Investigating and experimenting
- Estimating and measuring
- Analysing (Interpreting)
- Recording and communicating
- Designing and making: exploring, planning, making and evaluating

Primary Science Curriculum link

Strand unit: Weather; climate and atmosphere

Lesson 1 – Exploring weather

Lesson link

Junior and Senior Infants Programme
Chapter 4 Lesson 2: Recording temperature

1st and 2nd Class Programme
Chapter 4 Lesson 1: Observing a thermometer and Lesson 2:
Recording and taking the temperature

Resources

IWB 6 / PowerPoint 6: Rain gauges

IWB 7 / PowerPoint 7: Cloud cover

Materials to make a rain gauge:

2 litre empty bottle, 10ml plastic syringe (available from pharmacies) or 100ml graduated cylinder, metre stick, thread, container to collect the rain (e.g. a clean jam jar).

Materials to make anemometer:

Scissors, 4 small paper/plastic cups, 2 strips of stiff cardboard (same length), ruler, stapler, large drawing pin/thumb tac, sharpened pencil with eraser on the end, blu-tack or modelling clay, hard surface - cardboard or tile, stop watch.

Thermometers.

Teacher note: In this lesson children collect weather data for a period of 5 days. They should include data regarding temperature, cloud cover, wind speed and rainfall. They should graph their data, analyse and interpret their results.

Activity type: Discussion

With the children discuss the question “What is weather?” Record the children’s responses.

Questions to promote discussion

- 1 Look outside the window – what is the weather like today? (*cloudy, sunny, hot, cold, rain, fresh, muggy, windy*).
- 2 Does the weather stay the same all year long? What words would you use to describe the weather in Ireland during the spring, summer, autumn and winter?

Read, show or listen to a recent weather forecast with your class www.met.ie or www.rte.ie/weather

- 3 What factors do meteorologists talk about?
- 4 How far into the future do meteorologists predict the weather?
- 5 What does this tell us about the weather?

Teacher note: Explain to your class that weather is the current atmospheric conditions: temperature, rainfall, wind and humidity. Weather is what is happening right now, likely to happen tomorrow or in the very near future. Link the words on the board to each of these terms e.g. temperature = hot, cold; rainfall = rain; wind = windy, breezy, no wind; humidity = muggy, fresh.

Explain to the children that they are going to record the weather. First they are going to learn how to take accurate recordings of temperature, rain, cloud cover and wind.

3rd and 4th class could link with Junior and Senior infants classes using **Chapter 4 Lesson 2: Recording Temperature** from Junior and Senior Infants Programme. Junior and Senior infants classes could collect temperature data, while the 3rd and 4th class could collect information on cloud cover, rainfall and wind. Alternatively use the instructions below to collect temperature data with your class.

Activity type: Discussion

Learning how to record temperature accurately

Ask the children to discuss what it is they are recording when they think about temperature (for example air or ground temperature). What other aspects or characteristics of the weather might influence air temperature (cloud cover, rainfall and wind). Children can collect information about these too.

Introduce children to the thermometer. Discuss with the children how their temperature measurements can be collected accurately. Then in groups ask the children to discuss factors that they think should be kept constant when they are recording the daily temperature.

Teacher note: The following factors should be taken into account to ensure accurate daily readings:

- Time of day and location
- Distance from a building
- Shelter (e.g. trees, hedges etc.)
- Distance off the ground
- Number of measurements
- Length of time outside before measuring temperature

Activity type: Design and make

In groups the children design and make the rain gauges that they will use to record the rainfall over a five day period.

Exploring

Use **IWB 6 / PowerPoint 6** to discuss the structure and functions of a rain gauge.

Questions to promote discussion

- 1 What do you see in the pictures?
- 2 What are they used for?
- 3 What are they made from?

Tell the children that they are going to design and make their own small rain gauge. Show the children the materials that are available to them and discuss the criteria that their designs must meet.

Some suggested criteria for a rain gauge

It must be able to stand by itself.

Think about what the rain gauge measures: how can you record the level in the rain gauge?

Planning and making

After the whole class discussion on materials and criteria, the children work in small groups. They discuss their designs and make detailed drawings of them. They then make their rain gauges.

Evaluating

Each group evaluates their designs and places their rain gauges outside.

Activity type: Discussion

Use **IWB 7 activities / PowerPoint 7** to help the children understand how cloud cover can be measured. Discuss with the children how they could record cloud cover.

Teacher note: If percentages have not been covered the children could sequence the pictures in **IWB 7 / PowerPoint 7** from no cloud cover to most cloud cover.

Activity type: Design and make

Learning how to record wind speed

The children can design and make an anemometer to measure wind speed. For information on how to make an anemometer go to the Greenwave website www.primaryscience.ie/greenwave_introduction.php

Activity type: Recording

Divide the class into groups and ask each group to record one particular aspect of the weather, for example temperature, rainfall, cloud cover and / or wind speed. Encourage each group to discuss how they are going to ensure they take accurate recordings each day.

Recordings take place over a five day period. When the children have collected the data each group decides on how they would like to present the data they have collected (e.g. line / bar graph/ pictorially). Each group reports their data to the whole class group.

The children could be asked to identify any patterns they see between the temperature data and the other weather elements measured (cloud cover, wind, precipitation).

Extension

The following website might be useful:

www.trocaire.org/getinvolved/education/creating-futures

Lesson 2 – Introducing climate and climate change

Resources

IWB 8/ PowerPoint 8: Temperature in Ireland

Internet access to view:

Weather and climate video www.youtube.com/watch?v=ztWHqUFJRTs

The Story of Energy video www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/

Teacher note: In this lesson children investigate the difference between weather and climate and are introduced to the concept of climate change. They start with a homework activity which asks them to question parents and grandparents about their experience of weather. If children's parents have a different country of origin, collecting information on their lives can be used as a comparison climate zone to Ireland. You will need a map/ Google maps for this.

Activity type: Research

Questions to promote discussion

- 1 How could you find out information on Ireland's weather in the past?
- 2 Who might you ask?

Ask your parents and grandparents about the weather during their life time. Questions could include:

- 1 When you were younger was the weather in the summer hotter / sunnier?
- 2 When you were younger was the weather during the winter colder / wetter?
- 3 Do you think the weather has stayed the same?
- 4 How do you think the weather has changed?
- 5 Can you remember any times when the weather caused problems?

Activity type: Record, communicate and discuss

Create a class collage of quotes from parents and grandparents.

Questions to promote discussion

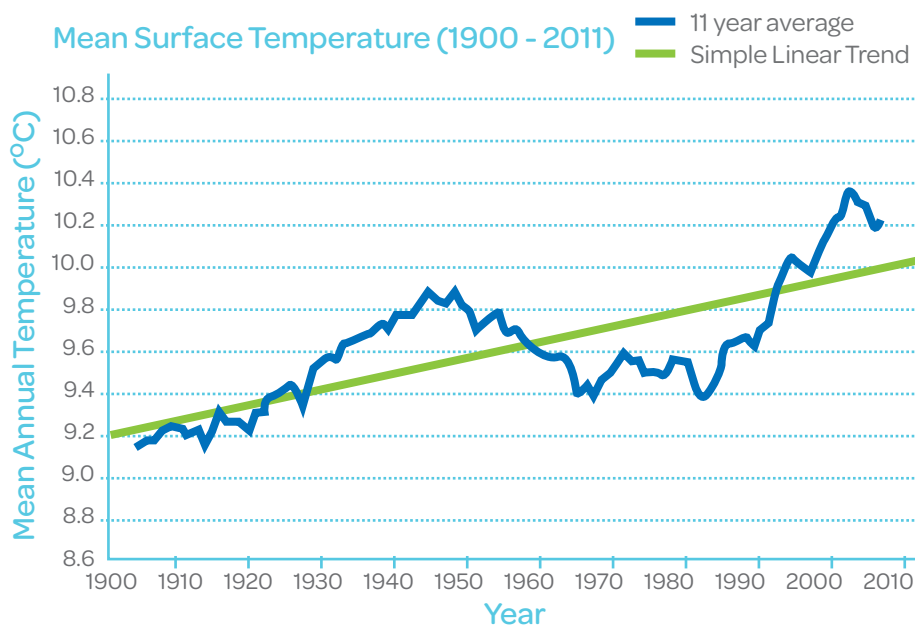
- 1 What does the information tell us about the climate / Irish climate?
- 2 Does the Irish climate ever get very hot like a desert?
- 3 Does it ever get very cold like the North Pole?

Activity type: Observe, interpret and discuss

Teacher note: Explain to the children that climate refers to the average weather conditions in a place over many years, usually at least 30 years (US Environmental Protection Agency).

Watch **Weather and Climate** video www.youtube.com/watch?v=ztWHqUFJRTs

Use **IWB 8/ PowerPoint 8** to discuss temperature in Ireland. The graph shows information about how the average air temperature in Ireland has increased from 1900-2011. Ask the children to think about what this graph is telling us about the Irish climate.



Source:
Met Éireann & Dr
Ned Dwyer, UCC

Teacher note: From the graph we can say that air temperature is getting hotter. Air temperature and the other factors of weather are also changing. Changes in our weather indicate that our climate is changing.

Watch **The Story of Energy** video www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/

Questions to promote discussion

- 1 Why do you think the climate is changing?
- 2 What is causing the climate to change?

Extension

Use **Guzzler Explains Climate Change worksheet** to review the main learning points of this lesson; this can be downloaded from:

www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/

Increased air temperature is thought to be linked to earlier growing seasons. Your class can join in the **Greenwave project** which records when spring comes to Ireland with plant and animal observations, visit www.primaryscience.ie/greenwave_introduction.php

SEAI's Lesson plan **Hot House, CO₂ / Climate Change Poster** and **Energy / CO₂ poster** go into more detail on climate change, carbon dioxide and the greenhouse effect. Go to www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/ to download from the resources section or to order.



CHAPTER 4: Investigating Insulation

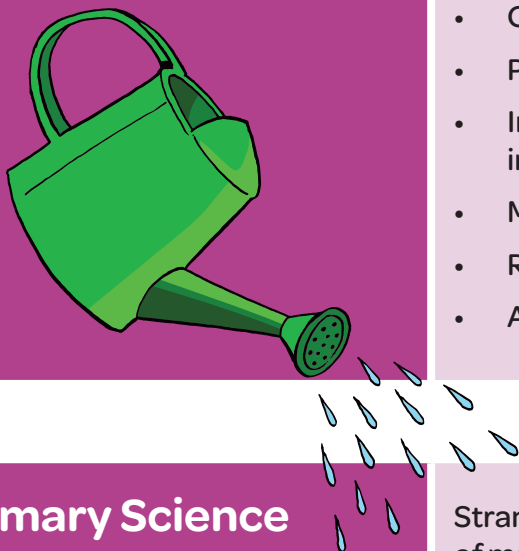
Aim

The aim of this chapter is to introduce children to insulation, and to investigate insulators, and how they work.

Overview of Chapter

Children explore insulation by looking at how certain materials are good at stopping the movement of heat. Children discuss which materials they think are good and bad insulators. They then plan and conduct an investigation on insulation.

Working Scientifically Skills



Through discussing, engaging with and reflecting on the investigations in this chapter, the children will be using the following working scientific skills:

- Observing and questioning
- Predicting
- Investigating and developing fair test investigations
- Measuring
- Recording and communicating
- Analysing

Primary Science Curriculum link

Strand unit: Heat; properties and characteristics of materials

Lesson link

Junior and Senior Infants Programme Chapter 4 Lesson 2:
Recording temperature

1st and 2nd Class Programme Chapter 4 Lesson 1:
Observing a thermometer and Lesson 2: Recording and taking
the temperature

Lesson 1 – Insulation in everyday life**Resources**

IWB 9 / PowerPoint 9: Clothes for different environments

Activity type: Discussion

Use **IWB 9 / PowerPoint 9** to encourage children to discuss different types of clothes people wear in different countries. **IWB 9 / PowerPoint 9** also provide children with opportunities to learn about materials that are good insulators.

Questions to promote discussion

- 1 What kind of clothes are the different people wearing?
- 2 What kind of clothes are the people wearing in sunny, hot, cold and cloudy climates?
- 3 Why do you think they wear these types of clothes?
- 4 Is there anything similar about the type of clothes people wear in hot, sunny, cold and cloudy climates?
- 5 Why might people wear light coloured clothes in hot and sunny climates?

Extension

Activity from the book **Guzzler Investigates Energy: Insulation (page 22)**

Investigation from the book **The Energy File: Insulation (page 23)**

Lesson plan **Don't lose your cool**

www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/

Lesson 2 – Keeping hot things hot**Resources**

IWB 10 / PowerPoint 10: Guzzler has a problem keeping his hot chocolate hot

PCM 10: Planning your investigation

PCM 11: Recording your investigation

Per group: 3 cups/mugs/beakers (must all be the same size), hot chocolate powder, spoons, measuring jugs, 1 thermometer, newspaper, bubble wrap, cloth, kitchen paper, scissors, cellotape, lids and elastic bands.

Activity type: Investigation

Teacher note: In this investigation the children make a warm drink and test different materials to see which is best at keeping their drink warm. It is not necessary to use very hot water.

Using **IWB 10 / PowerPoint 10** discuss Guzzler's problem:

Guzzler's hot chocolate drink keeps getting cold very quickly. Can you make a cup cosy that would help keep Guzzler's hot chocolate warmer for longer?

Investigation question: "Which material will keep Guzzler's hot chocolate warmest for longest?"

In groups the children discuss an investigation they could do to help Guzzler.

Provide the children with the equipment they could use to carry out their investigation. In groups the children discuss ways they could carry out the investigation and record on the planning sheets (**PCM 10**). They carry out the investigation and note their results on the recording sheets (**PCM 11**).

Questions to promote fair test investigation

- 1 How are you going to carry out the investigation?
- 2 What are you going to keep the same? (*the cups, the amount of water, the same starting off temperature of water, lid*)
- 3 What are you going to change? (*the material*)
- 4 How are you going to make sure your test is fair?
- 5 Would it be fair to put less hot chocolate in one cup? Why?
- 6 Would it be fair to wrap the tinfoil around the cup twice and the bubble wrap once? Why?
- 7 Would it be fair to use a large piece of cloth and a small piece of newspaper to make the cup cosy? Can you explain why?

Teacher note: Encourage children to design their own recording table. A sample is given below.

Insulator	Time 0 mins	Time 2 mins	Time 4 mins	Time 6 mins	Time 8 mins	Time 10 mins
Newspaper						
Tin foil						
Bubble wrap						

After the investigation discuss findings with the class.

Questions to promote discussion

- 1 Which material was best at keeping the hot chocolate hot?
- 2 Why do you think it was the best material? (*it stopped the heat getting out of the beaker*)
- 3 How do you know? What did you record?

Lesson 3 – Keeping cold things cold

Resources

IWB 11 / PowerPoint 11: Guzzler has a problem keeping his drink cold

PCM 10 and 11: Planning and results' sheets

Per group: 3 small plastic bottles with lids, bubble wrap, newspaper, tinfoil, scissors, ice, cold water, 1 thermometer, scissors, cellotape and elastic bands.

Activity type: Investigation

Teacher note: An insulator is a material that prevents the transfer of heat from a warm environment to a colder environment. Most children will understand that insulators are also good at keeping hot things hot. However, they may not realise that an insulator is also good at keeping cold things cold. Namely because they slow down the movement of heat.

Use **IWB 11/ PowerPoint 11** to discuss Guzzler's problem:

Guzzler has a problem his cold drink gets hot very quickly. Can you make a cosy that would help keep his cold drink cold for longer?

Investigation question: "Which material is best for keeping Guzzler's cold drink cold?"

Teacher note: This investigation can be carried out in a similar manner to the investigation that was carried out in Lesson 2: Keeping hot things hot.

Questions to promote discussion of Lessons 2 and 3

- 1 What did both investigations have in common? (*The same materials*).
- 2 What material was best for keeping the cold drink cold? Was this material the same material that kept the hot drink hot?
- 3 What does this tell us about insulators? What can they do?

Extension

Investigation from the book **The Energy File: Insulation (page 23)**

Lesson plan: **Don't lose your cool, investigating hot and cold** which can be downloaded from: www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/

CHAPTER 5: Saving Energy

Aim

The aim of this chapter is to explore energy that is used at home and how it can be saved.

Overview of Chapter

In this chapter the children develop skills and knowledge that will enable them to conduct an energy audit at home.

Working Scientifically Skills

In this chapter the children will be applying and developing the following scientific skills:

- Observing
- Recording and communicating
- Questioning
- Analysing
- Interpreting

Primary Science Curriculum link

Strand unit: Caring for my locality and area



Lesson 1 – Energy audit

Resources

IWB 12 / PowerPoint 12: Guzzler's house

PCM 12: Energy audit of your home

Internet access

Per group: A3 poster paper, crayons, markers, colouring pencils.

Finding out children's ideas:

Discuss with the children ways they use energy in their homes. Record the children's responses.

Questions to promote discussion

- 1 How do we use energy in our homes? Think about each room: The kitchen, the sitting room, the bathroom and the bedroom?
- 2 What electrical appliances do we use most often?

Activity type: Discuss

- 1 Use IWB 12 / PowerPoint 12 to raise children's awareness about insulation and saving energy.

Using PCM 12 Energy audit of your home, children conduct an audit of energy usage in their homes.

Suggest that the children will need to ask a parent or guardian to help them conduct the energy audit in their homes. It may be necessary to send an information letter to the parents in advance asking for their cooperation with the energy audit.

Activity type: Recording, researching and communicating

Collate the results from the home audits. Record the results on an IWB or on a large poster. Discuss findings.

Questions to promote discussion

- 1 What actions that waste energy happen most frequently?
- 2 What are the most popular energy saving actions?
- 3 How do you think energy use could be reduced?
- 4 Do you think it is useful to gather information about how the whole class uses energy at home? Why?
- 5 What things about energy saving would you tell other classes?

Children could use the following book to find out what the top tips are for saving energy, go to The Story of Energy

<https://www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/>

The children could make posters in small groups on ways to save energy at home (include 5 top tips drawn from the results of the survey). These posters could be displayed throughout the school.

Extension **e**

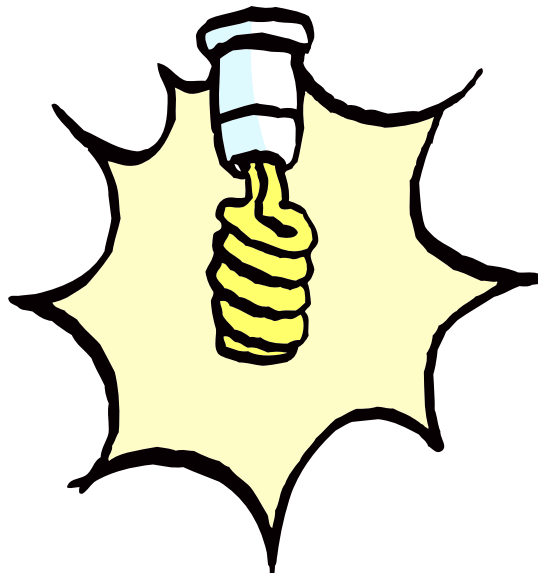
The following SEAI resources can be downloaded and used:

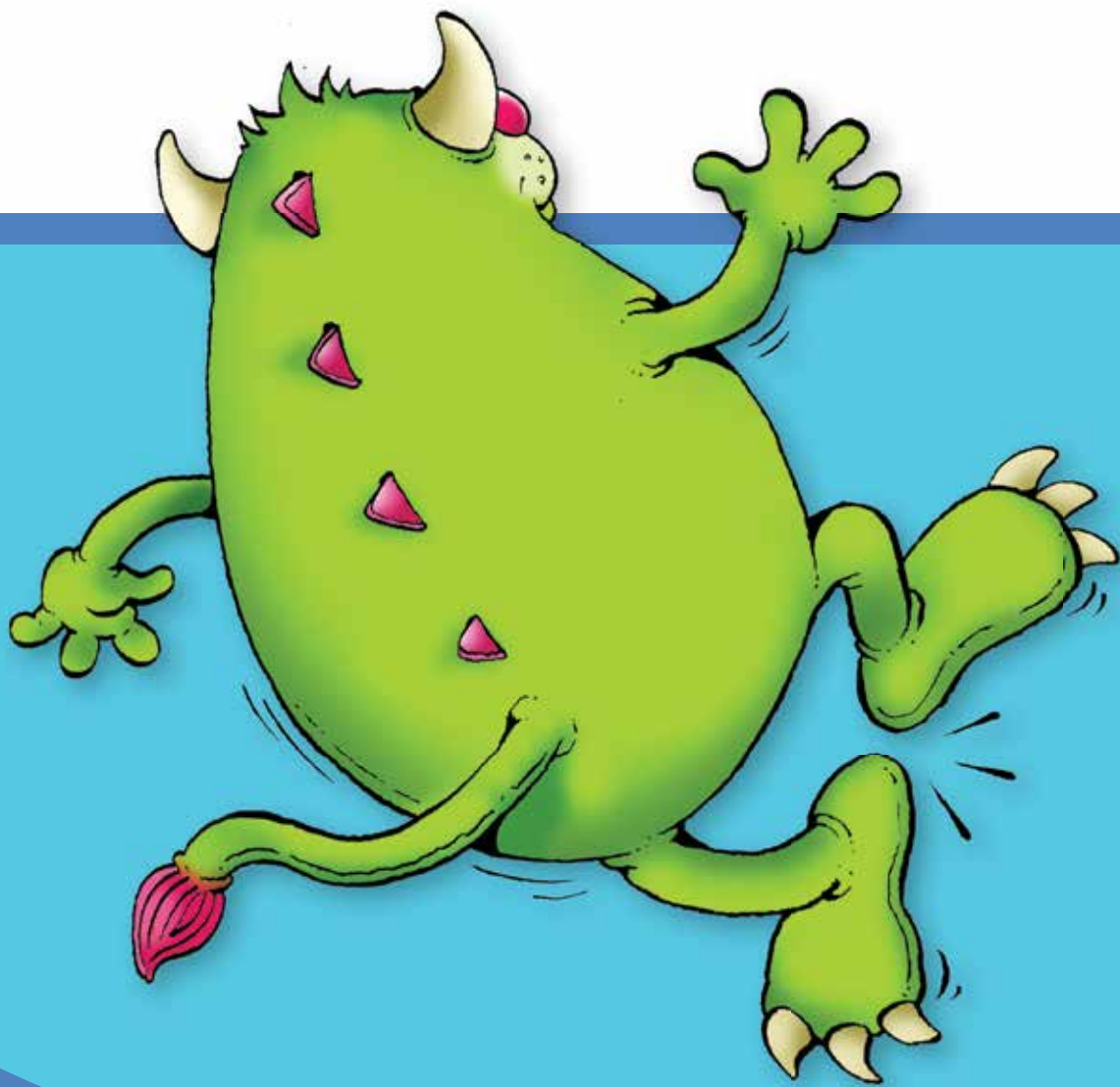
Investigation, go to The Energy File book for an investigation on insulation www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/

Worksheet, go to The Energy File book for a worksheet on Energy in Your Home www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/

Go to **Energy in Education** for videos and factsheets on saving energy at school.

Lesson plan, www.seai.ie/teaching-sustainability/primary-school/resources-for-teachers/





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