

TEACHER NOTES

HOW DO WE USE ENERGY?

Learners consider what fire is and how energy is released from burning fuels. They build and light a fire and think about how to extinguish a fire. They find out information about the Sun – as a burning celestial body and the energy that reaches the Earth. They consider energy transfers before designing and making a solar shower. Learners find out about solar ovens before designing and building their own. Carrying out internet research helps them to select and produce a marketing leaflet for the best solar oven. Learners are given information about innovations in solar energy use before thinking creatively as to a novel use.

CURRICULUM FOR WALES

Areas of Learning and Experience explored:

- Health and Well-being
- Humanities
- Languages, Literacy and Communication
- Mathematics and Numeracy
- Science and Technology

Activity also incorporates aspects of cross-curricular skills outlined in the LNF and DCF.

RESOURCES



Internet enabled device and internet access and books with information about the Sun, if required.

Materials to build and light a fire. Bread and marshmallows.

Materials to make the bottle for a solar shower - plastic bottles, scissors, tape, a thermometer, paint and some materials, e.g. black paper, white paper, cotton wool, foil, string, etc.

Materials to build a frame for a solar shower – dead wood and string.

Materials to build and test a solar oven - a shallow cardboard box, e.g. pizza box, scissors, aluminium foil, sticky tape, plastic wrap, black paper, newspapers, sticks, thermometer, bread, marshmallows, etc.

DOING THE ACTIVITY

- Most tasks require learners to work in pairs or groups.
- Encourage learners to share their ideas, and through open questioning, explain and justify their ideas when possible. Focus questions have been suggested to guide learners through the tasks.
- Some tasks might be more effective if pairs or groups of learners have access to an internet enabled device.
- When taking learners outdoors, it is essential that the [Countryside Code](#) is adhered to and any relevant risk assessments have been carried out with risks mitigated.

TASK 1

WHAT IS FIRE?

Explain to learners that this task should help them to understand what fire is and how energy is released from burning fuels.

Screen 3

The first screen tries to activate learners' prior knowledge and understanding. Show learners the [video](#) (about 1 minute) with sound on and ask them to think about the questions posed.

Focus questions

- What can you see?
- What can you hear?
- What could you feel?
- Imagine you were sat by the fire, what could you smell?
- How does the video make you feel? Why?

You could ask learners to share their ideas with the class.

Screen 4

Introduce learners to some different forms of energy – heat, stored (potential), sound, nuclear, light, movement (kinetic), chemical, electrical, magnetic. Then, ask them to discuss which forms of energy they think the fire is giving out. They can show their ideas by dragging and dropping the forms of energy into the diagram.

Screen 5

Invite learners to discuss how to build a fire outside using the questions posed.

Focus questions

- What do you need to build a fire?
- How could you build a fire outside?
- Where could you build a fire?
- What safety precautions would you need to take? Why?

Screen 6

Ask learners to try the activity on screen by dragging and dropping items to build and light a fire.

Screens 7-8

Learners are asked to think about which form of energy will be used to toast bread or marshmallows. Then, take them outside to build a fire. Let learners build the fire themselves and start it, so they learn by doing. You could let learners toast some bread or marshmallows.

Screen 9

Back inside, ask learners to consider the Fire Triangle – fuel, oxygen and heat - the three things needed for a fire to stay alight. Invite them to discuss the questions posed and select the correct part of the fire triangle to its means of extinguishing a fire.

Focus questions

Which part(s) of the fire triangle is removed to put a fire out when we:

- Smother it with a blanket.
- Use a fire extinguisher filled with CO₂.
- Hose it with plenty of water?

You could ask learners to share their ideas with the class.

TASK 2

WHAT IS THE SUN?

Explain to learners that this task will support their understanding of the Sun and energy transfers.

Screens 3-4

Ask each group of learners to mind map all their knowledge and ideas about the Sun. Then, to carry out internet or book research to find out more about the Sun. They should select 10 new facts about the Sun and add them to their mind map.

You could ask learners to share their ideas with the class.

Screen 5

Share the information about the Sun - The Sun is the star at the centre of our solar system. A star is a hot ball of plasma, inflated and heated by nuclear fusion reactions at its core. In pairs, ask learners to discuss the forms of energy from the Sun that we can sense on Earth and complete the diagram to show their ideas.

Screens 6-7

Share the information about energy transfers:

Energy cannot be made or used up. We can only transfer energy from one form to another.

When we transfer energy from one form to another, energy is given off as 'waste'.

Then, ask learners to rub their finger on the desk for one minute and to discuss the questions posed.

Focus questions

- What do you feel?
- What forms of energy can you sense?

You could ask learners to share their ideas with the class.

Screen 8

Explain to learners that when they rub their finger on the desk, they are transferring energy from one form to others. Then, to complete the diagram to show the forms of energy involved in the transfer.

You could ask learners to share their ideas with the class.

Screen 9

Explain to learners that solar energy is heat and light with infrared and ultraviolet radiation. Ask them to discuss the questions posed.

Focus questions

- Why do humans need energy from the Sun?
- How do we use energy from the Sun?
- How can you write a sentence to explain your ideas? Start your sentence with: If the Sun stopped burning...

You could ask learners to share their ideas with the class.

TASK 3

HOW CAN WE MAKE A SOLAR SHOWER?

In this task, each group of learners design and make a solar shower outside.

Screen 3

Explain to learners they are going to make a shower outside using a handmade frame of dead wood, a bottle and the Sun's energy. Ask them to discuss the focus question and make a list of criteria for a good shower. Explain to learners that they will use this criteria to check the quality of their solar shower.

Focus question

- What is a good shower?

Screen 4

Learners will need to decide on the best bottle design for their shower. Tell them that they will have a selection of plastic bottles, sticky tape, a thermometer, paint and some materials, e.g. black paper, white paper, cotton wool, foil, string, etc. Invite learners to devise an experiment to find out the best bottle design. They will need to take account of how best to warm the water and how to keep the water warm.

Screens 5-6

Invite learners to build a frame for their bottle from dead wood and string. Then, using their best bottle design (with holes added and temporarily sealed) make a frame to hold it in position using dead wood and string. Once they have set up their shower, they will need to leave it in the sunshine before testing it.

They should dismantle their frame when the shower has been tested and put all wood back from where it came.

Screen 7

To evaluate their shower, invite learners to check their solar shower against their success criteria and discuss the questions posed.

Focus questions

- If you could do this experiment again, what might you change to improve it?

Suggest they consider the...

- frame – design, sturdiness, height, etc.
- bottle – volume, design, set-up on the frame, how well it absorbed heat energy, etc.
- day chosen to set up the shower.

You could ask learners to share their ideas with the class.

TASK 4

HOW ELSE CAN WE USE SOLAR ENERGY?

This task introduces learners to solar ovens. However, the first screen asks them to interrogate an image of a solar oven to see if they can work out what it is. Therefore, it would be wise not to mention solar ovens until they have done the first screen.

Screen 3

In groups, ask learners to interrogate the image.



Screen 4

Explain to learners that in many countries, where there is no electricity supplied to houses, people use solar ovens. They can be used to:

- cook food
- purify water
- sterilise medical equipment.

Screens 5-6

Invite learners to design a solar oven. Tell them that they will have: a shallow cardboard box, e.g. pizza box, scissors, aluminium foil, sticky tape, plastic wrap, black paper, newspapers, sticks, thermometer, etc. Ask them to discuss the talking points posed.

- how a solar oven might work
- the forms of energy it uses and any energy transfers
- key design features needed for a solar oven to work.

They will need to draw some possible designs for their solar oven, showing materials and any measurements and choose the best design. Then, to choose the best design.

Screens 7-8

Take the learners outside to build and test their solar oven. Warn them to be careful as some parts will get very hot. Once they have tested it and made any improvements, they could use the solar ovens to, e.g. heat water, toast bread, melt marshmallows.

Screen 9

To evaluate their solar ovens, ask learners to discuss the questions posed.

Focus questions

- If you could make another solar oven, what might you change to improve it?

Suggest they consider...

- how they reflected light
- how they insulated the oven (kept the heat in)
- the size of the oven
- the day they did the experiment.

You could ask learners to share their ideas with the class.

Screen 10

Invite learners to discuss in their group the pros (advantages) and cons (disadvantages) of using a solar oven and to complete the table to show their ideas.

You could ask learners to share their ideas with the class.

Screen 11

Explain to learners that they are now going to research what they think is the best solar oven to buy in the UK. Then, to make a leaflet to encourage others to buy their 'best solar oven'. Ask them to consider including in their leaflet:

- how the solar oven works, e.g. energy transfers, reflection, insulation
- its size and capacity to heat food
- its price, reviews from customers, suitability for the UK
- why they think it is the best solar oven to buy.

TASK 5

WHY IS SOLAR ENERGY IMPORTANT?

Explain to learners that they will consider how else we use solar energy.

Screens 3-4

The first screen is one to allow time for learners to think about what they know and have learned. It is arranged as think-pair-share.

Start with - All organisms need energy to survive.

Think about: How do organisms gain energy?

Share your ideas with a partner.

Then - We need energy for our everyday lives.

Think about: How is energy used in our everyday lives?

Share your ideas with a partner.

Ask learners to share their ideas with the class.



Screen 5

Again, this screen is set up for think-pair-share.

Start with - We generate energy from a range of sources, e.g. solar, wind, water (hydro), nuclear, burning gas, wood, coal or petrol.

Solar energy is seen as 'clean energy'

Think about: Why do you think solar is seen as a clean form of energy?

Share your ideas with a partner.

Ask learners to share their ideas with the class.

Screens 6-7

Invite learners to evaluate solar energy using a PMI diagram, where:

P = positive ideas – pros: M = minus – negative ideas – cons: I = interesting ideas.

Ask them to type in their ideas and then drag and drop each one into the right section of the PMI diagram.

Then, ask learners to reflect on their minus ideas and discuss in their group how each minus idea might be overcome and how this could happen.

You could ask learners to share their ideas with the class.

Screen 8

Share the information about innovations in solar energy use:

- Solar-powered roads: Solar panels are installed on the surface of the road to generate electricity and provide lighting at night.
- Solar fabrics: Tiny, flexible solar panels can now be stitched into the fabric of clothing.
- Floating solar farms: Solar panels are installed on floating platforms on water such as lakes and reservoirs.
- Solar noise barriers: Solar panels are installed on noise barriers along motorways to generate electricity while reducing noise pollution.

Screens 9-10

This final screen is an opportunity for learners to think outside the box about other ways we could use solar energy. Invite them to brainstorm some ideas in their group and to select one idea and draw it with an explanation of how it works. Tell them that their explanation should include: its size, number of people it would help, how it might be used, energy transfers used, possible costs, possible benefits to the planet. Then, ask each group to present their idea to the class.