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| **What is sustainable energy?** |
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| Describe and explain what sustainable technologies could be used in school |
| **Subject(s):** Science, Design & Technology, Mathematics**Approx time:** 15-30 mins |  | **Key words / Topics:** * carbon footprint
* sustainability
* energy savings
* energy survey
* circular economy
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| **Stay safe** |  |  |
| Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for: • ensuring that any equipment used for this activity is in good working condition• behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others  Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol: ⚠ |
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| **Suggested Learning Outcomes** |  |  |
| * To be able to explain what ‘sustainable energy’ and ‘carbon footprint’ mean
* To be able to describe and explain what sustainable technologies could be used in their school
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| **Introduction** |  |  |
| Students are frequently hearing the phrases ‘carbon footprint’ and ‘sustainable energy resources’. The ‘Energy Efficiency’ scheme of work explores what these two phrases mean and for students to research what they, as a school community, can do to save energy and reduce their carbon footprint. The activities use the example of Howe Dell Primary School, which was designed with the principle of being a sustainable school. This provides a context to explore how well the students’ school compares, and what simple energy savings they could introduce to reduce their carbon footprint and save money as well. By using the example of Howe Dell Primary School, students have the opportunity to see how cutting-edge technology and science is being applied. |
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| **Purpose** |
| In this activity, students will be shown the Green School video and use this in discussion to clarify their understanding of the terms sustainable energy and carbon footprint.This activity could be used as a starter in Design & Technology or Science. |
| **Activity** |  | **Teacher notes** |
| Show the students the Green School film. Ask them to briefly discuss, as a class, the following questions:1. What do we mean by ‘sustainable energy’ resources?2. What types of sustainable energy resources are found in buildings today? 3. What does ‘carbon footprint’ mean and how is it calculated? |  | Key point – these are resources that are naturally replenished. They are not destroyed as they are used.E.g. wind turbines and solar panels. Local examples could be used to illustrate the point. |
| **Differentiation** |  |  |
| **Basic** |  | **Extension** |
| In question 1, the definition could be explained and students could be asked to list different sources of energy and sort them into sustainable and non-sustainable.For question 3, the carbon footprint, a worked example could be shown and students asked to explain why it is important. |  | An additional question could be used, which requires them to use their analytical skills: how does using sustainable resources differ from just restricting our use of non-renewable resources (i.e. use less to make them last longer)?In their responses, the key point should be that the traditional linear economy (design-make-dump), we often try to restrict our use of resources to make them last longer. However, this doesn’t ‘fix’ the problem. True sustainable resources give us the potential of a circular economy (design – make – reprocess – reuse), where the Earth’s resources could last indefinitely. |
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| **Resources** film |  | **Required files icon-docicon-pdficon-ppt** |
|  Green School film* Internet access with projector
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| **Additional websites** |  |  |
| There are a number of websites that have information about defining a carbon footprint, including:* The Carbon Trust: [www.carbontrust.com](http://www.carbontrust.com)
* Wikipedia: <https://en.wikipedia.org/wiki/Carbon_footprint>

In addition, the following two sites could be used although they are more aimed at businesses rather than for educational use: * Anthesis Group: <http://anthesisgroup.com>
* Carbon Footprint: [www.carbonfootprint.com](http://www.carbonfootprint.com)
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| **Related activities (to build a full lesson)** |  |  |
| **Starters** (Options)* ACTIVITY: **Energy Efficiency 1**
* ACTIVITY: Photovoltaic cells - Intro

**Main** (Options)* ACTIVITY: Energy Efficiency 2
* ACTIVITY: Photovoltaic cells – Investigating circuits
* ACTIVITY: Photovoltaic cells – Design and Make
 | **Extension** (Options)* ACTIVITY: Photovoltaic cells - Modifications

**Plenary*** Opportunities within activity for presentations, peer/self-assessment
* Reflection on Objectives and PLTS skills used
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| **The Engineering Context** film |
| * **The story** Green School
* **How it works?** Interseasonal Heat Transfer (IHT)
* **Who makes it work?** Chani Leahong
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| **Curriculum links and PLTS** |
| **England**Science * KS3 3a, 4c, 22d, 22g, 23e

Design & Technology * KS3 3a, 3d
 | **Northern Ireland**Technology & Design(Objective 1) Developing pupils as Individuals* Mutual understanding

(Objective 2) Developing pupils as Contributors to Society* Ethical awareness

(Objective 3) Developing pupils as Contributors to the Economy and the Environment* Education for sustainable development

Learning Outcomes* Research and manage information effectively to investigate design issues, using Mathematics and ICT where appropriate
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| **Scotland**Technologies* TCH 3-02a

**GCSE D&T**AQA D&T* 3.1.1, 3.1.2, 3.2.1, 3.2.3, 3.3.2

Edexcel D&T* 1.2.4, 1.3, 1.14.2, 1.14.3, 1.14.4, 1.14.8, 1.15.1g

Eduqas D&T* 2.1 Core: 1, 2, 3
* 2.2 Core: 4

OCR D&T2.1a vi, 2.2, 3.1a i/iii/iv, 3.2, 3.3a i/iv, 5.2c iii, 5.3d, e**GCSE Science**AQA Combined Science Trilogy* 5.9.2, 6.1.3

AQA Combined Science: Synergy* 4.4.1.3, 4.4.1.4, 4.4.1.5, 4.8.2.4

Edexcel Combined Science* Chemistry: 8.24, 8.25a, 8.26
* Physics: 3.13

Eduqas Combined Science* 2.2: 12d, e, f, g
* 2.3: 1.2f
 | **Wales****GCSE Engineering**AQA Engineering3.1.3**GCSE Chemistry**AQA Chemistry* 4.9.2

Edexcel Chemistry* 8.24, 8.25a, 8.26

Eduqas Chemistry* 12d, e, f, g

OCR Gateway Science: Chemistry A* C6.3c, d, e
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| OCR Gateway Science: Combined Science A* C6.2c, d, e
* P6.2a

OCR 21st Century Science: Combined Science B* C1.3
* P2.2: 1, 2
 | OCR 21st Century Science: Chemistry B* C1.3
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| **GCSE Physics**AQA Physics* 4.1.3

Edexcel Physics* 3.13

Eduqas Physics* 1.2f

OCR Gateway Science: Physics A* P8.2a

OCR 21st Century Science: Physics B* P2.2: 1, 2
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| **Personal, learning & thinking skills (PLTS)** |
| * Creative thinker
* Independent enquirer
* Effective participator
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