

Practical Action links to the science curriculum in Wales



Background

The **science curriculum in Wales** offers a real opportunity for teachers to enhance pupils' learning by the integration of global issues in their teaching. Teaching in a global context, using methodologies that encourage discussion and debate, coupled with an **enquiry** based approach, not only engages and motivates pupils but deepens their scientific knowledge and understanding.

The national curriculum for Wales identifies the skills for each subject and the range of contexts, opportunities and activities through which these skills should be developed and applied.

Skills across the curriculum

The curriculum has a clear focus on the needs of learners and the process of learning, and on the development and application of skills.

Learning across the curriculum

The curriculum identifies three areas of learning:

- ▶ knowledge and understanding of Wales
- ▶ personal and social development and well-being
- ▶ awareness of the world of work

The curriculum is learner-centred and skills-focused giving both opportunities and challenges for schools wanting to provide a relevant and motivating educational experience.

The programmes of study have been designed to offer teachers and learners:

- ▶ a focus on developing skills, particularly thinking, communication, ICT and number skills
- ▶ continuity and progression 3–19
- ▶ opportunities to engage in contemporary issues and different types of activities to suit learners' and teachers' needs and schools natural and physical resources in different parts of Wales
- ▶ maximum flexibility in selecting appropriate, relevant content from the considerable range of opportunities to suit the needs, interests and preferred experiences of all learners
- ▶ opportunities to link across the **Range of Interdependence of Organisms, The Sustainable Earth and How Things Work**
- ▶ opportunities to link with other subjects, such as geography, design and technology and the PSE framework

In the programme of study the importance of teaching through a global lens is highlighted within the **Skills and Range** (Interdependence of organisms, The sustainable Earth, How things work).

The Skills framework includes developing thinking, developing communication, developing number and developing ICT, both within the programmes of study and the associated level descriptions. Enquiry focuses on Planning, Developing and Reflecting.

This emphasis is **learner-centred** and has embedded within is assessment for learning vocabulary. In order to be **relevant to all learners**, contemporary contexts have been included in the Range that provide opportunities for learners to link their own experiences and current issues with scientific theory.

At Key Stages 2 and 3, learners should be given opportunities to build on the experiences gained during the Foundation Phase, and to promote their knowledge and understanding of Wales, their personal and social development and well-being, and their awareness of the world of world. Curriculum Cymraeg, Personal and Social Education and Careers and the World of Work are highlighted.

Contemporary contexts could include case studies of how science is having both a positive and negative impact on the developing world, technical briefs written by Practical Action for engineers in developing countries, information on websites, and blogs or articles written by people who work in development. ' Links to the main science curriculum are below. However some material could also be linked to Personal and Social Education and Careers and the World of Work.

This document identifies areas within the Welsh KS2 and 3 science curriculum where global contexts can be used can be used as the starting point or focus of a lesson. It gives example of resources available from Practical Action, including both teaching materials and links to secondary sources from our main website such as technical briefs, blogs and videos.

Skills

Communication

Communicate clearly by speech, writing, drawings, diagrams, charts, tables, bar charts, line graphs, videos, and ICT packages, using relevant scientific vocabulary, terms, symbols and convention.

Communication	Reporting findings from enquiry including oral and written presentations, displays or presentation of results and conclusions	▶ <i>Cool Pots</i> ▶ <i>Sandy seeds</i> ▶ <i>Stop the spread</i> ▶ <i>Global Goals-string activity</i>
Thinking	Learners develop their thinking across the curriculum through the processes of planning, developing and reflecting	▶ <i>Plastic challenge</i> ▶ <i>Energy and the Global Goals</i> ▶ <i>Stop the Spread</i> ▶ <i>Power of the World</i>
Developing	Learners develop their number skills across the curriculum by using mathematical information, calculating, and interpreting and presenting findings	▶ <i>Squashed Tomato Challenge</i> ▶ <i>Wind Power Challenge</i>

Enquiry

Pupils should be given opportunities to carry out different types of enquiry, e.g. pattern-seeking, exploring, classifying and identifying, making things, fair testing, using and applying models.

Fair testing Using and applying models	Setting up simple comparison tests, reporting on results and conclusions. Planning different types of scientific enquiry and controlling variables	▶ <i>Squashed Tomato Challenge</i> ▶ <i>Wind Power Challenge</i> ▶ <i>Stop the Spread</i> ▶ <i>Beat the Flood</i> ▶ <i>Floating Garden Challenge</i>
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KS2 – Interdependence of organisms

Pupils should use and develop their skills, knowledge and understanding by investigating how animals and plants are independent yet rely on each other for survival.

Topic	Global context	Practical Action teaching resources and information
2. The need for a variety of foods and exercise for human good health	Looking at different foods eaten by different people around the world...and that we all need the basic food groups The effects of a poor diet on some children in the developing world. The spread of disease caused by bad hygiene	▶ <i>Food stories</i> ▶ <i>Growing food, concept cartoon</i> ▶ <i>Yummy Yoghurts</i> ▶ <i>Pumpkins against poverty</i> ▶ <i>Stop the Spread</i>
4. Through fieldwork, the plants and animals found in two contrasting local environments, g. identification, nutrition, life cycles, place in environment	How plants are grown in different countries... problems of too much or too little water Comparing food webs in the UK with food webs in developing countries Issues around food security	▶ <i>Floating Garden Challenge</i> ▶ <i>Global food & farming</i> ▶ <i>Plant image gallery</i> ▶ <i>Rice-fish culture – information</i> ▶ <i>Pumpkins against Poverty</i> ▶ <i>Pumpkins in Bangladesh – information</i>
5. The interdependence of living organisms in those two environments and their representation as food chains	Climate change – how it affects environments and thereby people's lives. Plants grown in different parts of the world are adapted to their environment e.g. salt resistant rice in Bangladesh, potatoes that can grow in extreme cold in Peru	▶ <i>Floating Garden Challenge</i> ▶ <i>Case studies on climate change</i> ▶ <i>Rice adapted to saltier water – information</i> ▶ <i>Potatoes in Peru and Seed Fairs in Kenya</i> ▶ <i>Pumpkins against poverty</i>
6. The environmental factors that affect what grows and lives in those two environments, e.g. sunlight, water availability, temperature	The importance of biodiversity for small farmers in the developing world The importance of soil conditions for growing crops in the developing world	▶ <i>Global CREST Challenges, water and food</i> (for KS3 but could be adapted) ▶ <i>Sandy Seeds</i>
7. How humans affect the local environment, e.g. litter, water pollution, noise pollution	What makes water unsafe to use? Air pollution caused by smoke from household fires	▶ <i>Water for the world - Primary</i> ▶ <i>Water Conservation - concept cartoon</i> ▶ <i>Smoky Homes</i>

KS2 – The sustainable Earth

Pupils should use and develop their skills, knowledge and understanding by comparing the Earth with other planets, investigating materials around them and considering the importance of recycling.

Topic	Global context	Practical Action teaching resources and information
3. A comparison of the features and properties of some natural and made materials	Comparing the use of locally available sustainable resources with man-made resources	▶ Beat the Flood ▶ Beat the Flood - video ▶ The Plastics Challenge
4. The properties of materials relating to their uses	Importance of using materials for specific uses e.g earthquake or ability to withstand flooding	▶ Floating Garden Challenge ▶ Beat the Flood ▶ Beat the Flood - video ▶ Global CREST Challenges, shelter and water (for KS3 but could be adapted) ▶ Monsoon Proof Roof ▶ Plastics Challenge ▶ Flood Alert
6. A consideration of what waste is and what happens to local waste that can be recycled and that which cannot be recycled.	Introduction to plastic recycling and the importance of recycling Big issues around sustainability with 6R's (Rethink, Refuse, Reduce, Reuse, Recycle, Repair) Sustainable companies – who consider reducing waste as central to their work Designing waste storage systems to encourage waste recycling and Designing new products from waste and recycled materials	▶ Plastic challenge ▶ The 6R's ▶ Plastics Challenge ▶ Recycling- concept cartoon ▶ Sustainable companies - information ▶ Marvellous Microbes - video ▶ Plastics Challenge ▶ Stop the Spread

KS2 – How things work

Pupils should use and develop their skills, knowledge and understanding by investigating the science behind everyday things, e.g. *toys, musical instruments and electrical devices*, the way they are constructed and work.

Topic	Global context	Practical Action teaching resources and information
1. The uses of electricity and its control in simple circuits	What wouldn't you be able to do or have without electricity? Using circuits to devise a flood warning device	▶ Access to energy – video ▶ Energy and the Global Goals ▶ Flood Alert
2. Forces of different kinds, e.g. <i>gravity magnetic and friction, including air resistance</i>	Use of levers, pulleys etc. to transport people and produce in the developing world	▶ Squashed Tomato Challenge ▶ Tuins - information ▶ Global CREST Challenges, transport and water (for KS3 but can be adapted) ▶ Treadle pump - information ▶ Pump it up - video
3. The ways in which forces can affect movement and how forces can be compared	Gravity Ropeways Use pumps in irrigation _lb rm ns kn u_rcp	▶ Squashed Tomato Challenge ▶ Tuins - information ▶ Wind Power Challenge ▶ Treadle pump - information ▶ Pump it up - Video
4. How different sounds are produced and the way that sound travels	Different instruments around the world	
5. How light travels and how this can be used	Solar lanterns etc. Importance of light in education, running a business Solar Cookers	▶ Solar lanterns - information

KS3 - Interdependence of organisms

Pupils use and develop their skills, knowledge and understanding by investigating how humans are independent yet rely on other organisms for survival, applying this to life in countries with different levels of economic development.

Topic	Global context	Practical Action teaching resources and information
2. How food is used by the body as fuel during respiration and why the components of a balanced diet are needed for good health	The consequences of poor nutrition on some people in the developing world. The Bottom Billion	▶ <i>Iodine initiative</i> - learning from Tanzania ▶ <i>Water and Sanitation</i> - images ▶ <i>Water and Sanitation</i> - video ▶ <i>Marvellous Microbes</i> - video ▶ <i>Pumpkins Against Poverty</i> - for KS2 but could be adapted
4. The interdependence of organisms and their representation as food webs, pyramids of numbers and simple energy- flow diagrams	Comparing food webs in UK with food webs in a developing country Problems of too much or too little water	▶ <i>EuropeAfrica</i> - food connections ▶ <i>Turning compost into food</i> - information ▶ <i>Floating Gardens Challenge</i> ▶ <i>Pumpkins against Poverty</i> - for KS2 but could be adapted
5. How and why food webs are affected by environmental factors, e.g. <i>light intensity, water availability, temperature, and their fluctuations</i>	Climate change - how humans contribute to it and what is being done to help communities prepare for it (disaster risk reduction) Availability of clean water across the world Issues around food security	▶ <i>Beat the Flood</i> ▶ <i>Beat the Flood</i> - video ▶ <i>Wild Weather</i> ▶ <i>Floating Garden Challenge</i> ▶ <i>Climate change</i> – blogs ▶ <i>Disaster risk reduction</i> – information ▶ <i>Design for a better world</i> ▶ <i>Global Goals, string activity</i> ▶ <i>Water for the World</i> ▶ <i>Stop the Spread</i> ▶ <i>Global CREST Challenges</i> - water ▶ <i>Global STEM challenges</i> - food ▶ <i>Growing food</i> - concept cartoon
6. How human activity affects the global environment, e.g. acid rain, greenhouse effect, and the measures taken to minimise any negative effects and monitor them, e.g. <i>by Earth observation Satellites</i>	Looking at the impact of products on people and the environment throughout their lifecycle. Climate change and greenhouse effect Looking at the values of designers, including the choice of materials. The role of science and technology in alleviating poverty in the developing world	▶ <i>Lifecycle analysis</i> ▶ <i>Beat the Flood</i> ▶ <i>Beat the Flood</i> - video ▶ <i>Wild Weather</i> ▶ <i>Belief Circles</i> ▶ <i>Sustainable designers</i> ▶ <i>Sustainable companies</i> ▶ <i>Design for a better world</i> ▶ <i>Global Goals</i>

KS3 – Interdependence of organisms - cont

7. Applications of science, medicine and technology that are used to improve health and the quality of life, including those in countries with different levels of economic development.	The effect of diets not rich in minerals e.g. iodine on health	▶ Iodine initiative ▶ The Meal Deal
	Smoke inhalation from stoves in the home Reusing or recycling plastics	▶ Smoky Homes ▶ The Plastics Challenge ▶ Recycle or reuse ▶ Design for a Better World ▶ Recycling , concept cartoon

KS3 – The sustainable Earth

Pupils use and develop their skills, knowledge and understanding by investigating the materials in the Earth and its atmosphere and how they can change, and apply this in contemporary contexts.

Topic	Global context	Practical Action teaching resources and information
2. The physical and chemical properties of some elements, compounds and mixtures and how mixtures can be separated by simple techniques	Using sachets of chemicals to clean water	▶ Global CREST Challenges, water
	Filtering water to make it fit to drink	▶ Water for the World
	Solar distillation	▶ Solar distillation – technical brief
	Testing salts with silver nitrates	▶ Iodine initiative - learning from Tanzania ▶ Water! Water!
5. The properties of sustainable materials and how these are related to their uses in everyday life, e.g. in the <i>construction and manufacturing industries</i> , and the importance of sustainability	The use of local sustainable materials in construction	▶ Global CREST Challenges, shelter ▶ Beat the Flood - video ▶ Earthquake resistant housing - information ▶ Flood resistant housing - information
	Importance of using materials for specific uses e.g. ability to withstand flooding	▶ Flood Alert ▶ Beat the Flood ▶ Stop the Spread

KS3 – How things work

Pupils should use and develop their skills, knowledge and understanding by investigating the science involved in a range of contemporary devices/machines and evaluate different energy resources and possibilities.

Topic	Global context	Practical Action teaching resources and information
1. The behaviour of current in electrical circuits	Using current symbols to devise a flood warning device	▶ Flood Alert
2. The conservation of energy and ways in which energy can be stored	Ways of keeping food cool or reducing the rate of heat loss through insulation	▶ zeer pot fridge – technical brief ▶ Cool pots - KS2 but can be used for KS3 ▶ ireless cooker - information ▶ ireless cooker – technical brief ▶ Solar drying of food – technical brief
3. How familiar devices/machines work by using electricity, light, sound and other energy transfers	Ropeways systems	▶ Squashed Tomato Challenge ▶ Tuins - information ▶ Global CREST Challenges – transport and water
	Pumps e.g. water pumps	▶ Treadle pump – information ▶ Treadle pump – technical brief ▶ Hand pumps – technical brief ▶ Pump It - Video ▶ Power for the World
4. The forces in devices and their relationship to work done and power	Turbines used in renewable energy – wind and hydro	▶ Wind Power Challenge ▶ Hydroelectric power – information ▶ Hydroelectric power – technical brief
5. How renewable and non-renewable energy resources are used to generate electricity and the implications of decisions made about their use	Use of renewable energy	▶ Moja island ▶ Wind Power Challenge ▶ Power for the World ▶ Energy crossword ▶ Energy revision cards ▶ Energy loop game ▶ Global CREST Challenges, energy ▶ Renewable energy poster ▶ Top ten reasons why renewable energy is cool ▶ Concept Cartoon, Free energy, concept cartoon ▶ Energy and the Global Goals
	Efficiency of different stoves	▶ Meal Deal ▶ Smoky Homes
6. Technologies under development, which may lead to more efficient use of energy resources or using them in new ways, e.g. hydrogen-powered cars, using cooking oil/gasohol, as replacements for diesel/petrol	Innovation in new energy sources	▶ Practical Action's work on energy - information ▶ Fuels – technical brief ▶ Energy resources – technical brief ▶ Improved cooking stoves - information