Practical Action links to the science curriculum in England

Background

The **new science curriculum** 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 emphasis on teaching in context and understanding the uses and implications of science is made clear in the aims.

Aims

The national curriculum for science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to **answer scientific questions about the world around them**
- are equipped with the scientific knowledge required to **understand the uses and implications of science**, today and for the future.

In the programme of study the importance of teaching through a global lens is highlighted within scientific knowledge and conceptual understanding and the nature, processes and methods of science.

Scientific knowledge and conceptual understanding

…teachers will wish to use ***different contexts*** to maximise their pupils' engagement and motivation to study science.

The nature, processes and methods of science

Working scientifically, might be embedded within the content… so that pupils learn to use a variety of approaches to answer relevant scientific questions. These types of scientific enquiry should include… ***researching using secondary resources.***

This emphasis on **research using secondary sources** is a new requirement of the curriculum. Such secondary sources 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.

This document identifies areas within the KS2 and KS3 science curriculum where global contexts can be used as the starting point or focus of a lesson. It gives examples of resources available from Practical Action, including teaching materials and links to secondary sources from our main website.

PRACTICAL ACTION
Technology challenging poverty

KS3 – Biology

Topic	Global context	Practical Action teaching resources and information
Nutrition and digestion		
The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases	The consequences of poor nutrition on some people in the developing world.	*Iodine Initiative*
Plants making carbohydrates in their leaves by photosynthesis and gaining minerals, nutrients and water from the soil via their roots	Solutions for growing crops in developing countries affected by floodin	*Pumpkins against Poverty* *Floating Garden Challenge* *Design for a Better World*
Gas exchange systems		
The impact of exercise, asthma and smoking on the human gas exchange system	Death due to smoke in the home from stoves causes more deaths than malaria	*The Meal Deal* *Pump It* – video *Smoke* – video *Smoky Homes*
Cellular respiration		
The process of anaerobic respiration in humans and micro-organisms including fermentation	The role of micro-organisms in biogas production	*Marvellous Microbes* – video
Reproduction		
Reproduction in plants, including ... fertilisation, seed and fruit formation	Global solutions for growing plants	*Pumpkins against Poverty* *Floating Garden Challenge* *Food and Agriculture* - videos
Relationships in an ecosystem		
The importance of plant reproduction through insect pollination in human food security	Issues around food security	*Wild Weather* *Beekeeping* – technical brief
How organisms affect, and are affected by, their environment, including the accumulation of toxic materials	Climate change – how humans contribute to it and mitigate against its effects	*Stop the Spread* *Pumpkins against Poverty* (KS2 but could be adapted) *Global Goals* *Design for a Better World* *Floating Garden Challenge* *Climate Change* – blogs
Inheritance, chromosomes, DNA and genes		
The importance of maintaining biodiversity and the use of gene banks to preserve hereditary material	GM crop debate Importance of biodiversity for small farmers in developing world	*Pumpkins against Poverty* (KS2 but could be adapted) *Biodiverse Agriculture* – technical brief

KS3 – Chemistry

Topic	Global context	Practical Action teaching resources and information
Atoms, elements and compounds		
Chemical symbols and formulae for elements and compounds		▸ *Plastics Challenge*
Pure and impure substances		
Simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography	Filtering water to make it fit to drink and clean enough to wash hands is countries with limited water	▸ *Stop the Spread* ▸ *Design for a Better World* ▸ *Global Goals* - display materials ▸ *Water for the World* ▸ *Global Project ideas*
	Solar distillation	▸ *Solar distillation* – technical brief
Materials		
Properties of ceramics, polymers and composites (qualitative).	Materials used globally in buildings to make cook stoves and smoke hoods	▸ *Global Project ideas* ▸ *Beat the Flood*
The periodic table		
The varying physical and chemical properties of different elements	How deficiency of vital elements impacts health	▸ *Iodine Initiative*
Earth and atmosphere		
Earth as a source of limited resources and the efficacy of recycling	Recycling as an important process in a sustainable world	▸ *Plastics Challenge* ▸ *Reuse or Recycle*
The production of Co_2 by human activity and the impact on climate	Climate change and global warming	▸ *Design for a Better World* ▸ *Global Goals string activity* ▸ *Global Goals* - display materials ▸ *Wild Weather*

KS3 – Physics

Topic	Global context	Practical Action teaching resources and information
Calculation of fuel uses and costs in the domestic context		
Fuels and energy resources **Domestic fuel bills, fuel use and costs**	Use of renewable energy Efficiency of different stoves Black Carbon Costs of and different uses of fuel globally	▸ *Smoky Homes* ▸ *The Meal Deal* ▸ *Wind Power Challenge* ▸ *Moja island* ▸ *Energy and the Global Goals* ▸ *Energy* - homework and revision activities ▸ *Global Project ideas* ▸ *Renewable energy poster set* ▸ *Top ten reasons why renewable energy is cool* ▸ *Free energy* – concept cartoon ▸ *Energy resources* – technical brief

KS3 – Physics *continued*

Topic	Global context	Practical Action teaching resources and information
Energy changes and transfers		
Simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged	Ropeways systems	***Squashed Tomato Challenge*** ***Tuins*** – information ***Global Project ideas***
	Pumps e.g. water pumps	***Pump It*** – videos ***Treadle pump*** – technical brief ***Hand pumps*** – technical brief
Heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation	Ways of keeping food cool or reducing the rate of heat loss through insulation	***Zeer pot fridge*** - information ***Zeer pot fridge*** – technical brief ***Cool Pots*** (for KS2 but could be adapted) ***Fireless Cooker*** - technical brief ***Smoky Homes***
Other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels	Flood warning systems	***Flood Alert***
	Drying food to preserve it	***Solar drying of food*** – technical brief
	Transport	***Squashed Tomato Challenge***
	Renewable Energy	***Power for the World*** ***Wind Power Challenge*** ***Hydroelectric power*** – technical brief ***Fuels*** – technical brief ***Improved Stoves*** – information ***Biomass*** - technical brief
Forces		
Forces as pushes or pulls, arising from the interaction between two objects	Turbines used in renewable energy – wind and hydr	***Wind Power Challenge*** ***Hydroelectric power*** – technical brief ***Power for the World***
	Hand pumps	***Treadle pump*** – technical brief ***Hand pumps*** – technical brief
Pressure in fluids		
Pressure in liquids,increasing with depth; upthrust effects, floating and sinking		***Floating Garden Challenge***
Electricity and electromagnetism		
Electric current, measured in amperes, in circuits, series and parallel circuits	Electrical circuits used in flood warning system	***Flood Alert***