



ENERGY IN ACTION

ACTIVITIES FOR
JUNIOR CYCLE



Inquiry based resources available
for **Science, Home Economics,**
Geography and **CSPE**

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WHAT IS ENERGY IN ACTION ALL ABOUT?

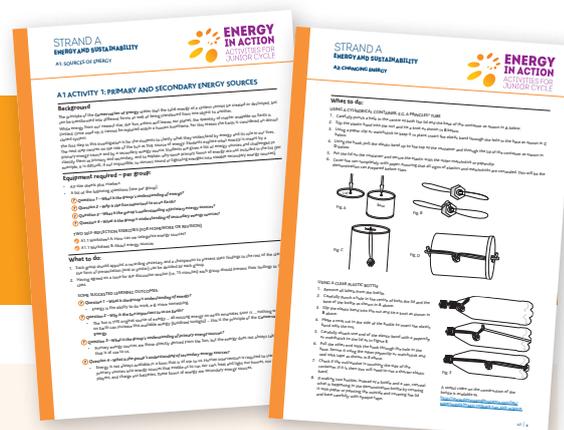
Energy in Action offers a collection of activities and ideas designed to support the teaching and learning of energy and sustainability in the junior cycle classroom. These activities have been developed for use with an inquiry approach to energy education and aim to enhance students' scientific knowledge, skills and competencies.

The programme was developed by the Sustainable Energy Authority of Ireland (SEAI) in collaboration with junior cycle teachers and the Centre for the Advancement of STEM Teaching and Learning (CASTeL) at Dublin City University (DCU).

Energy in Action is focussed on providing students with opportunities to consider and tackle problems that the future holds, e.g. sustainable practices in schools, homes and beyond. It will develop young peoples' knowledge across a range of topics, such as, energy sources, efficiency, conservation, climate change and global warming and link these concepts to students' daily lives. Only with a generation of energy-smart and resource-conscious citizens, can Ireland bring about the sustainability it needs to ensure a prosperous future.



Visit www.seai.ie/energyinaction to download all the resources



HOW TO USE ENERGY IN ACTION

This programme presents a range of activities, ideas and projects aimed at making the topic of sustainable energy accessible to junior cycle students. Each topic is presented with an overview and suggested methods of approach, followed by activities and suitable questions for facilitating further class discussion. The topics addressed complement the junior cycle Science, Home Economics, Geography and CSPE course curricula.

Topic Information:

- Overview describes the theme and overall aim of each section.
- Suggested approaches offer some ideas for introducing the topic to the class and guiding it through the activities.
- Useful resources provide links to helpful online resources to support further learning.

Activity Information:

- Background gives a short overview of the scientific background of the activity.
- Equipment required lists everything needed to carry out the activity and includes a setup diagram where needed.
- What to do outlines how students may carry out the activity themselves.
- Discussion points suggests questions to promote discussion and further activities.
- Worksheets are provided where necessary.

Pedagogical Approach:

These activities are intended to be used with an inquiry learning approach. Rather than presenting students with facts, this approach facilitates students being actively involved in the learning process through the use of probing questions and presenting challenging scenarios. Inquiry pedagogy aims to build on a student's prior knowledge while at the same time addressing any misconceptions students may have and promoting changes in attitudes and behaviours. Teachers can adopt the approach that best suits their needs, for example, one in which students are given the 'what to do' with the inherent questions or a more open approach where students are given the focus and equipment for the activity and facilitated to figure out what and how to do it.

PROGRAMME OUTLINE

Strand A:

Energy and Sustainability

We introduce students to the concepts of primary and secondary energy sources and explore different forms of energy like elastic potential energy and kinetic energy. This will help students to visualise and understand the relationships between different forms of energy.

The importance of energy and sustainability is key, and we show how everything we need for our survival and wellbeing depends directly or indirectly on delicate balances in the natural environment. The limits of our resources are illustrated by exploring how much land and fresh water is available to use.

Wind and tidal energies are explored and students learn about electric vehicles including the electric transport programme being led by SEAI on the Aran Islands.

Strand B:

Heat Energy

This focuses on how heat energy is transferred between bodies, with a view to helping students to understand the principle of Conservation of Energy. Using readily available materials, students carry out activities that demonstrate this principle through its practical application. Thermofilm is used to help students to explore the relationship between heat and temperature.

Students explore how they can save energy both at home and in school by changing their daily behaviour. Next we look at heat energy by conduction using various materials including metal kitchen sieves and coins on paper to demonstrate the process. Then we explore heat energy by convection using an activity on land and sea breezes to show convection currents at work. The next step is to explore how heat is transferred by looking at how a water heating system operates.

The complex idea of energy transfer by radiation is explored by looking at practical examples such as how solar heating works in the home.

Strand C:

Energy Awareness

The main focus in this area is on the connection between work, energy and food, and teaches students how to read food labels, understand the factors that affect reaction rates, and explore the role of effective surface areas.

Energy audits emphasise the importance of being personally aware of how we use energy. By helping students to understand energy labels, we provide them with an important tool for monitoring their energy use. Sankey Diagrams are explained to show a powerful representation of energy flow. SEAI's One Good Idea project is explored which encourages students to promote simple changes to improve energy efficiency and combat climate change.

Finally we highlight the impact that too much carbon dioxide has on the environment.

Strand D:

Problem Solving in the Real World

Students need to be encouraged to actively engage with energy problems at both a local and global level. Students are given the tools to evaluate their own energy use and make responsible choices on issues such as heat and solar energy, the environmental impacts of using energy and greenhouse gas emissions. By using the SEAI website students will better understand how to assess the energy use of their own home and in their school.

The biodegradability of various packaging materials is explored through a hands on approach. The class can work as a team to build a small compost bin and monitor the breakdown of the contents. As well as teaching students how sustainability affects them, this provides an opportunity for the class to develop their research abilities and presentation skills, and learn how to make scientific deductions.

Overview of Topics and Resources:

SUBJECT KEY: SCIENCE (S), HOME ECONOMICS (H), GEOGRAPHY (G), CSPE (C)

STRAND A: ENERGY AND SUSTAINABILITY

Subject SHGC	Activity Reference and Title
A1: SOURCES OF ENERGY	
SH	A1 Activity 1: Primary and Secondary Energy Sources
SH	A1 Activity 1.1 Worksheet A: How can we categorise energy sources?
SH	A1 Activity 1.1 Worksheet B: About energy sources
A2: CHANGING ENERGY	
S	A2 Activity 1: Throwing Pebbles
S	A2 Activity 2: The Obedient Bottle
S	A2 Activity 3: The Power of the Wind — Making Your Own Generator
S	A2 Activity 3 Worksheet C: The Power of the Wind — What do you think?
S	A2 Activity 4: Exploring the Wind Turbine
S	A2 Activity 5: The Energy of Bounce
S	A2 Activity 5 Worksheet D: The Energy of Bounce
S	A2 Activity 6: The Energy of Swing
S	A2 Activity 7: Heating and Cooling
S	A2 Activity 8: The Energy of Skating
A3: ENERGY AND SUSTAINABILITY	
SGC	A3 Activity 1: Visualising why Sustainability? Is there enough land for everyone?
SGC	A3 Activity 1 Printout: Map of the World
SGC	A3 Activity 2: Visualising why Sustainability? How much freshwater is there?
A4: EXPLORING OCEAN AND TIDAL ENERGIES	
S	A4 Activity 1: Faraday's Eureka Moment
S	A4 Activity 2: What Moves?
S	A4 Activity 3: Energy from the Sea
S	A4.3 (i): Discussion Points: Wind versus Sun
S	A4.3 (ii) Discussion Points: Why go to Sea?
S	A4 Activity 4: Exploring Electric Vehicles

STRAND B: HEAT ENERGY

Subject SHGC	Activity Reference and Title
B1: HEAT ENERGY AND TEMPERATURE	
S	B1 Activity 1: Designing, Constructing and Using a Thermometer
S	B1 Activity 2: The Difference between Heat and Temperature
S	B1 Activity 3: Hot versus Cold
S	B1 Activity 3 (i): It's All Relative (teacher-led)
S	B1 Activity 3 (ii): Calibrating Thermofilm
	B1 Activity 3 Printout: Thermofilm calibration chart
S	B1 Activity 3 (iii): Visualising Energy Flow
S	B1.3 Discussion Points: Colour and Temperature
S	B1 Activity 4 History note A: Celsius and the Reverse Scale
S	B1 Activity 4 History note B: Lord Kelvin; the Irish Connection
B2. HEATING PROJECT — SAVING ENERGY AT HOME	
SH	B2 Activity 1: Heating Project — Saving Energy at School
B3: HEAT TRANSFER BY CONDUCTION	
SH	B3 Activity 1: Metal Kitchen Sieve
SH	B3.1 Discussion Points: The Flame and Wire Mesh
SH	B3 Activity 1 History note C: The Davy Lamp
S	B3 Activity 2: Coin on Paper
SH	B3 Activity 3: The Balloon that Does Not Burst
SH	B3 Activity 4: Boiling Water in a Paper Cup
SH	B3.4 Discussion Points: Water Coolant
B4: HEAT TRANSFER BY CONVECTION	
SH	B4 Activity 1: Teabag Rocket
SH	B4 Activity 2: Spinning Spiral
SH	B4 Activity 3: Land and Sea Breezes
SH	B4.3 Discussion Points: Breezes
SH	B4 Activity 4 (i): Convection in Water
SH	B4 Activity 4 (ii): Convection in Water (alternative activity)
SH	B4 Activity 5: Transferring Heat
SH	B4 Activity 6: Simulating Ocean Currents
B5: HEAT ENERGY BY RADIATION	
S	B5 Activity 1 (i): What Colour Surfaces Absorb Heat?
S	B5 Activity 1 (ii): Hot Boxes (alternative activity)
S	B5.1 Discussion Points: Hot Colours
S	B5 Activity 2: What Types of Surfaces Absorb Heat?
SG	B5 Activity 3: Solar House Heating

STRAND C: ENERGY AWARENESS

Subject SHGC	Activity Reference and Title
C1: ENERGY AND FOOD	
SH	C1 Activity 1: Food Energy
SH	C1 Activity 1 Worksheet A: Food energy record sheet
SH	C1 Activity 2: Fire Clouds (teacher demonstration)
SH	C1.2 Discussion Points: Dust
C2: MY ENERGY AUDIT	
SHGC	C2 Activity 1: Food Miles
SHGC	C2 Activity 1 Worksheet B: What's the cost of your shopping basket?
SHGC	C2 Activity 2: Testing Personal Energy Efficiency
SHGC	C2 Activity 2 Worksheet C: How good is your personal energy efficiency at school?
SHGC	C2 Activity 2 Worksheet D: How good is your personal energy efficiency at school?
SHC	C2 Activity 3: Energy Labels and Appliances
SHC	C2 Activity 3 Worksheet E: Domestic appliances
SHC	C2 Activity 3 Worksheet F: Energy labels
SHC	C2.3 Worksheet G: How much do your home appliances cost?
SHG	C2 Activity 4: Energy Sankeys
SHG	C2 Activity 4 (i): Constructing a Sankey Diagram
SHG	C2 Activity 4 Worksheet H: Reading a Sankey Diagram
SHG	C2 Activity 4 (ii): Examples of In-depth Analysis
SHG	C2 Activity 4 (iii): Examples of Analysing Systems for Energy Efficiency
SHGC	C2 Activity 5: One Good Idea
C3: GLOBAL WARMING	
SGC	C3 Activity 1: Global Warming in a Bottle
SGC	C3 Activity 2: The Effect of Global Warming on the Polar Ice Caps and Melting Glaciers

STRAND D: PROBLEM SOLVING IN THE REAL WORLD

Subject SHGC	Activity Reference and Title
D1: RETAINING HEAT ENERGY	
SGC	D1 Worksheet A: Energy usage by sector
SGC	D1 Printout: Pie chart
SH	D1 Activity 1: Comparing Coffee Cups
SH	D1.1 Discussion Points: Insulation Materials
SH	D1 Activity 2: Melting Ice
SH	D1 Activity 2 Worksheet B: Insulation Materials
SH	D1.2 Discussion Points: Ice Cubes
SH	D1 Activity 3: U-values
SH	D1.3 Discussion Points: Glazing
SH	D1 Activity 3 Worksheet B: Record sheet for U-values
SH	D1 Activity 4: Heating the Home
SH	D1.4 Discussion Points: Heat Transfer
SH	D1 Activity 5: The Good Home
D2: ENVIRONMENTAL IMPACT OF USING ENERGY	
SGC	D2 Activity 1 Worksheet C: Wind and Coal – The environmental impact
D3: CUTTING GREENHOUSE GAS EMISSIONS	
SC	D3 Research: Cutting Greenhouse Gas Emissions
D4: SMART PACKAGING	
SH	D4 Activity 1: Smart Packaging
D5: SOLAR ENERGY	
SG	D5 Activity 1: Solar Energy
SG	D5.1 Discussion Points: Solar Energy





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In collaboration with

