

EduTrend Contents

W4C · ENVIRONMENTAL SCIENCE · MIDDLE SCHOOL

Energy Detectives

Where is our school losing energy?

Ages 12–14 | Level: Intermediate | 60 minutes | Groups of 3 · up to 30 | Activity 04

Inside: activity at a glance · step-by-step session plan · facilitator notes · 3 student worksheets · assessment checklist

ACTIVITY 04 · AT A GLANCE

Energy Detectives

Students carry out an energy audit. They record lights and devices left on, use device power ratings to estimate energy use, and test insulating materials with a cooling experiment. They then recommend changes to reduce the school's energy use and carbon emissions.

Learning outcomes

By the end of the session students can:

- calculate energy use from power and time;
- plan and carry out a fair insulation test;
- interpret cooling curves;
- make evidence-based recommendations.

KEY WORDS

energy · power · kilowatt-hour · insulation · heat loss · efficiency · carbon emissions

CURRICULUM LINKS

Science: energy, heat transfer. Maths: calculations with units, line graphs. Citizenship: sustainability.

1	2	3	4	5	6
QUESTION	**INVESTIGATE**	**MEASURE**	**ANALYSE**	**ACT**	**REVIEW**
What is the issue?	Collect evidence	Count and record	Find patterns	Plan a solution	Did it work?

Materials (per group)

- Audit sheet and clipboard
- Device power ratings list
- 3 identical cans or beakers, warm water (teacher pours, about 60 °C)
- Insulating materials: bubble wrap, wool, foil, newspaper
- Thermometers, stopwatch
- Worksheets 1, 2 and 3

Before the session

- Agree areas for the audit.
- Collect power ratings of common devices.
- Prepare warm water in flasks.
- Cut insulating materials to size.

SAFETY

Teacher pours warm water (no hotter than 60 °C). Do not touch or unplug electrical equipment during the audit.

ACTIVITY 04 · SESSION PLAN

Step by step

Timings are for 60 minutes. The audit can be repeated at the end of the day.

Time	What happens	Say or ask
0–5 min **Hook**	Show the school's energy bill or a smart meter reading.	*"Where does all this energy go?"*
5–20 min **Audit**	Groups record lights and devices left on in their area.	*"What is on that doesn't need to be?"*
20–25 min **Calculate**	Energy (kWh) = power (kW) × time (h) for devices found.	*"Which device uses most?"*
25–45 min **Insulation test**	Groups wrap cans in different materials, add warm water and record temperature every 2 minutes.	*"How will you keep it fair?"*
45–55 min **Analyse**	Plot cooling curves and compare.	*"Which material is the best insulator?"*
55–60 min **Recommend**	Groups write three recommendations.	

CHALLENGE CARD (print or copy onto the board)

Recommend three changes that would save the most energy in school. Support each with a calculation or test result.

ACTIVITY 04 · FACILITATOR NOTES

The science in brief

Energy use in buildings comes mainly from heating, lighting and electrical devices. The energy used by a device depends on its power and how long it is on: energy in kilowatt-hours = power in kilowatts × time in hours.

Heat is lost from warm buildings by conduction, convection and radiation. Insulating materials trap air, which is a poor conductor, slowing heat loss. Reducing energy use lowers costs and, where energy comes from fossil fuels, reduces carbon dioxide emissions.

Common ideas to listen for

- “Devices on standby use no energy.” Many still use some power.
- “Insulation makes things warmer.” It slows heat transfer; it does not create heat.
- “Energy is used up.” Energy is transferred, often to the surroundings as heat.

Adapting the activity

Support

Test two materials and provide a pre-drawn graph.

Stretch

Calculate the annual cost of a device left on overnight using a given electricity price.

WORKSHEET 1

Energy audit

Name: _____ Class: _____ Date: _____

Record devices that are on.

Audit

Room	Device	Power (W)	Needed?
1			
2			
3			
4			
5			
6			

Energy calculation example

A 100 W light on for 8 hours uses 0.1 kW × 8 h = _____ kWh.

WORKSHEET 2

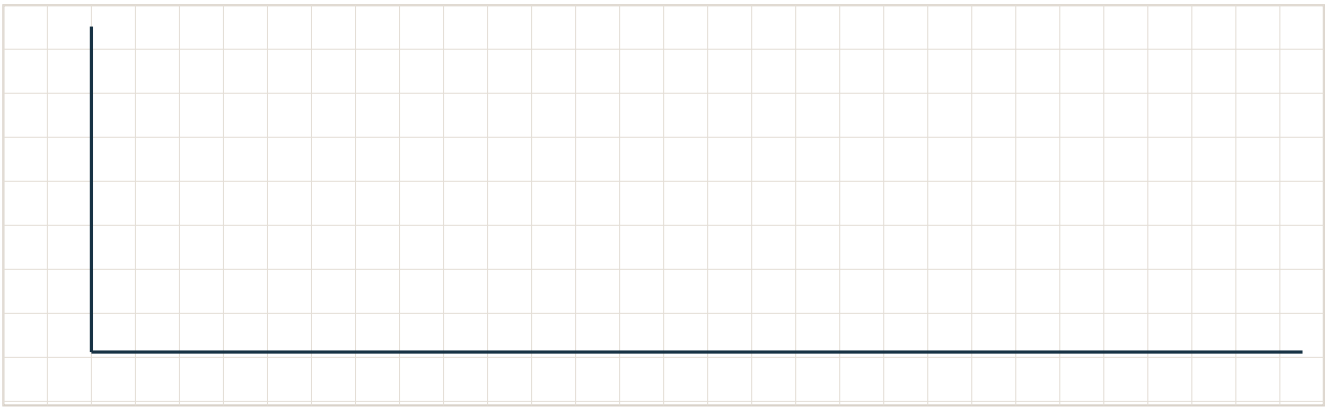
Insulation test

Record temperature every 2 minutes.

Results

Time (min)	Control	Material A	Material B	Material C
0				
2				
4				
6				
8				
10				

Cooling curves



y-axis: temperature (°C)

x-axis: time (min)

WORKSHEET 3

Recommendations

Give three recommendations with evidence.

Recommendations

Change	Evidence
1	
2	
3	

FOR THE TEACHER

Assessment checklist

Use during the session. One sheet covers up to eight students; copy as needed.

Student	Calculates energy correctly	Tests insulation fairly	Recommends with evidence

Suggested codes: W = working towards · E = expected · G = greater depth

ABOUT THIS ACTIVITY

Energy Detectives is a sample activity from the EduTrend Contents W4C Environmental Science programme (middle school, level: intermediate). Every activity in the programme follows the same format: a practical challenge, a clear session plan, facilitator notes and ready-to-print worksheets, so that teachers, club leaders and parents can run it without extra preparation.

Full 15-, 20- and 32-week programmes are available from EduStore at edutrend.org.

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