****

**Energy awareness
Lesson 4: Energy data processing**

**Introduction**

Students collate, process and analyse light usage data. They plot simple charts to help them to visualise data, spot patterns and suggest solutions to modify behaviour and save energy.

**Learning objectives**

* Collate and process numerical data
* Present numerical data in visual form
* Analyse data and make inferences from it about energy use
* Use these inferences to make proposals to modify behaviour to save energy

**You will need**

Downloadable resources:

* Student handouts
* Lesson slides
* Lesson plan

Other resources:

* Student work from previous lesson, spreadsheet (optional)

**Introduction**

Prior to the lesson you should have gathered timings of how long a light was left switched on in at least one location over a period of time. If you do not have this, you can use the example data given.

Recap the data gathered in previous lessons about how much energy has been used by lighting in a particular area(s).

**Collate data**

Share the raw numerical data as you have collected with all the students (e.g., timings from different locations for multiple time periods, or readings from a single timer). If you do not have this, you can use the example data.

Ask students to work in pairs or small groups to collate the data in spreadsheets or in a written table, and plot simple column or bar charts of the data (slides 3 and 4).

**Analyze data**

Invite groups to consider what the data shows and to draw possible conclusions from it (slide 5). Discuss their findings as a class. Examples could include:

* Do some locations use more electric light that others? (e.g., in the example, usually the classroom uses more electricity than the cupboard)
* Compare different days: can you spot any patterns?
* Look for anomalies: in the example the huge number for the cupboard at the weekend and larger number on Monday could suggest someone left the light on before going home on Friday and it wasn’t spotted until Monday
* You might expect to see higher numbers in the Sat/Sun column as it accounts for two days, but the school may be empty which may mean the numbers should be lower.

Discuss the impact of this on cost and energy use and highlight the need to help people turn off lights to use less electricity and save money.

**Propose solutions**

Invite students in their groups, or individually, to write suggestions for how they might encourage people to change their behavior to save energy and money on lighting based on analysis of the data (slide 6). Examples could include:

* raise awareness in the school of energy use on lighting
* have student monitors to check lights are turned off at the end of the day
* put signs up by light switches
* create a visual or audible alarm using a micro:bit to show when lights have been on for too long - you could use radio to send a message from a micro:bit in a cupboard to one in the classroom
* ask people to consider if lights are really needed, eg on sunny days
* Discuss which of their suggestions are most likely to be effective and why they think this is. What barriers do they think there are to people changing their behaviour?

**Review**

Recap the learning objectives and discuss with students their views on how the data collected has helped them to draw conclusions about energy use and make suggestions for modifying behaviour and saving money.

Invite them to consider other areas of energy use they could apply these skills to (slide 7).

**Differentiation**

Support

* Students may benefit from supportive groupings where they are able to use their strengths in the group task.
* You could provide partially completed spreadsheets or a blank framework to fill in and students could record their solutions on a whiteboard or voice recorder.

Stretch & challenge

* Students could consider and present suggestions for making the data more reliable, for example
* Take readings over a longer period of time
* Deploy more micro:bit timers to measure data in more locations
* Deploy more than 1 micro:bit timer in each location and compare data or take an average

**Opportunities for assessment**

Informal, or more formal, assessment of spreadsheets and written work:

* Has the data been captured and recorded accurately?
* Are charts clear and correctly labelled?
* Has data been analysed to draw sensible conclusions?
* Have practical proposals been made based on the data collected to modify behaviour and reduce energy use?