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**Energy awareness  
Lesson 1: Energy around us**

**Introduction**

Students relate the UN Global Goals on Climate action to the use of energy in their school or home and start planning where to use the micro:bit to collect data about electric light usage.

**Learning objectives**

* Understand what UN Global Goal 13 (climate action) is and why it’s relevant to us
* Understand how our energy use can have an impact on climate change
* To consider and plan how we might monitor our energy use at home or at school and how awareness can drive changes in behaviour.

**You will need**

* Downloadable resources:
  + Lesson slides
* Other resources:
  + Paper - writing (optional), pens (optional)

**Introduction to the Global Goals**

If you wish, recap or introduce the UN Global Goals and Goal 13: Climate Action. You may want to use the introduction videos and activities on Introducing the Global Goals and Climate action (slides 3 & 4).

**Exploring - 'learning is the first step to doing'**

Discuss with students the key message of the second video: ‘learning is the first step to doing’. Key points:

* Climate change includes:
  + the global warming driven by human emissions of greenhouse gases
  + and the resulting shifts in weather patterns.
* Although the climate has changed at other times in the Earth’s history, this is the first time humans have caused it to change.
* Many sources of energy have an impact on climate change by putting CO2 into the atmosphere.

Invite students to consider (individually, then in pairs or small groups):

* How can we make a contribution to combating climate change by becoming more aware about our energy use?
* How might we be able to use data to drive changes in behaviour?

Guide students to consider the types of energy used in everyday life: heating, air conditioning, lighting, cooking, petrol in cars. Students may have ‘smart’ energy meters at home or their parents may have used buses or cars powered by electricity or alternative fuels. (Slide 5)

**Energy use around us**

Introduce the idea that the micro:bit has sensors for temperature, light and magnetism, all of which could be used to monitor energy use. Explain that in following lessons students will be making light sensors to monitor energy use. (Slide 6)

**Planning to monitor energy usage for lighting**

Invite students to consider and plan in pairs or small groups how they might be able to monitor energy use in our schools or homes. Guide them to understand that if we know where energy is being used, and have data to support it, we can take steps to reduce energy usage, saving CO2 emissions and also save money. For example, with data collection we might discover:

* Which places use the most energy.
* When energy is most used. Are there patterns of behaviour you could discover, for example is lighting left on at night or at weekends?
* Does it make a difference what kind of lighting is used? Light bulbs are rated in Watts - the more Watts, the more energy they use. More efficient kinds of lighting generate more light and less heat. LED lighting uses less electricity than fluorescent lighting which uses less energy than incandescent lighting. (Slide 7)

**Planning micro:bit placement**

Depending on the number of micro:bits and battery packs available to you, ask students to work in their groups to plan how to monitor lighting in several places: individual lights in a classroom, different rooms, storage areas or large cupboards. Guide students to consider where they will get good data: away from daylight / windows / people getting between the sensor and the light source. Questions include:

* Is daylight, sunrise or sunset a factor? Is it winter or summer? We want the timer to be triggered by electric lighting, not light coming in from windows.
* Would people moving around the room affect readings?
* How do these factors affect where we place our data recorders?
* If the ceilings are high, it may be difficult to place sensors near light sources, how can we mitigate that? e.g. make cardboard shields for micro:bit to reduce light from windows, place micro:bits away from windows, place in windowless cupboards or storage areas.

Ask students to draw maps of their classroom, school or home and annotate these to suggest good locations to place light energy monitors. (Slide 8)

**Review**

Invite students to present their maps and discuss similarities and differences amongst the groups.

Re-cap the learning objectives and look forward to the next lesson where students will take sample light readings in their chosen locations to calibrate a micro:bit light timer. (Slide 9)

**Differentiation**

Support

* Students could be provided with ready printed maps along with a printed version of the questions they are asked to consider.
* Place students in supportive pairs or groups and encourage them to record everyone’s ideas.
* Students could present their ideas in ways other than a written plan (e.g. a video)

Stretch & challenge

* Students could consider measuring heat and electricity use using magnetism. For example the https://energyinschools.co.uk/ project uses micro:bits as sensors for heat and electromagnetic fields generated by electrical cables to monitor energy use.
* Students could also plan how you could use the micro:bit's temperature sensor and compass (magnetometer) to measure other kinds of energy use.
* They could also make use of the micro:bit's radio function to collect data remotely.

**Opportunities for assessment**

Informal assessment of students’ plans.

* Do they show understanding and application of the task?
* Have they chosen and justified accessible locations where lighting is switched on and off at different times and hence could be measured?