****

**Energy awareness
Lesson 3: Energy data collecting**

Students program and calibrate their micro:bit light timers and place them in their chosen locations to record energy use data.

**Learning objectives**

* To calibrate and deploy a data logger (micro:bit light timer)
* To collect environmental data (light usage) over time

**You will need**

Downloadable resources:

* Lesson slides
* Lesson plan
* HEX files

Other resources:

micro:bits, micro:bit battery packs, student work from previous lesson

**Recap and introduction**

Recap the calibration readings gathered in the last lesson for each area you’re going to monitor. What did students decide about which locations might allow reliable collection of data, and why? (Slide 3)

**Make and test a micro:bit light timer**

Introduce the energy light timer project in MakeCode blocks or Python (slide 4).

Downloaded program files:

* energy-awareness-3-makecode.hex
* energy-awareness-3-python.hex

Explain students will need to use the data gathered in the last lesson to calibrate the timer for their chosen locations.

Highlight that although the code looks complex, they only need to modify one block. Model this process, using the instructions below (slide 4) before asking students to modify their own code and flash it onto their micro:bits.

* Use data gathered using the light meter in the previous lesson: light readings when the lights in your chosen location are on and off.
* Put your light on reading into the code where the LIGHT variable is set, replacing the number 100.
* Attach a battery pack and place your micro:bit under the light you want to monitor. You should see a dot on the display when the light is off, and the display lights up when your light is on. If this doesn't work, consider using the Light meter project from lesson 2 again to find the light level when the light is on, or move the micro:bit.
* The micro:bit will keep timing and when you press button B it will show how long the light has been switched on in minutes.

Depending on the number of students and locations, you may wish to assign different locations to students for this testing process.

Optionally show the video from the Energy light timer Make it: code it project to explain how to set up and use the light timer: <https://youtu.be/kc31WZ80Rxw> (Slide 5).

**Collect data**

Once testing has been successful, ask students to reset the time variable by pressing the reset button on the back of the micro:bit(s).

Invite them to then place them in their chosen locations and leave them for an agreed longer period of time, e.g. over a day, overnight or even over a weekend.

Once the time has lapsed, retrieve the light timers and gather the data for later analysis in lesson 4. (Slide 6)

**Review**

Invite students to recap to each other what they modified in the code and why. Ask them to share any issues they had in the testing stage and how they overcame them.

Discuss what students expect to discover from the data.

If you wish, review the learning objectives (slide 7).

**Differentiation**

Support

* Students may require additional assistance, from a teacher or a partner, to modify the code and test the timer.

Stretch & challenge

* Students could explore how the code works in greater depth, in particular the role played by the hysteresis variable which makes sure the timer is only turned on or off.
* They could use the micro:bit's radio function to collect timing data remotely.
* Students could use Python instead of MakeCode blocks and adapt the Python timer to use non-volatile storage to record timings and retain them even when the battery packs are removed, such as in the Max-min temperature logger.

**Opportunities for assessment**

Informal and observational assessment of students' work during the task. E.g.:

* Was the code modified to match the data recorded in the previous lesson effectively?
* Was the code flashed on to the micro:bits successfully and any problems worked through systematically?
* Were the micro:bits deployed in the correct locations successfully?
* Were students able to explain what they modified and why and what they expect to discover from their data collection?