**Data handling**

**Lesson 2: Data treasure hunt**

**Introduction**

In this lesson, students go on a treasure hunt to find data values relating to the school. They then learn about sensors and write simple programs using the MakeCode editor to use the BBC micro:bit to record the temperature in different locations around the school. Students then consider what the data they have collected show and identify any patterns. You will ideally need physical micro:bits to complete this lesson, although if you do not have these you can still use the simulator.

**Time:** @60 minutes

**Learning objectives**

* To understand that some devices uses sensors
* To write simple programs using sensors
* To use the BBC micro:bit to collect data

**Materials needed:** printout of *school treasure hunt,* printout of *collecting data*, computers/laptops with access to MakeCode editor, micro:bits and associated hardware including battery packs.

**Lesson summary**

1. Introduction: School treasure hunt (15 minutes)
2. Introducing sensors (10 minutes)
3. Collecting data with the micro:bit (30 minutes)
4. What does our data show? (5 minutes)

**Introduction: School data treasure hunt (15 minutes)**

* Invite students to recap in pairs what data is and the types of data that they used in the previous lesson (name, age, address, data of birth).
* Ask students to consider what data they could collect about the school (**slide 2**).
* Use **slide 3** to display a copy of the school treasure hunt worksheet. Discuss students’ initial ideas on what the sheet shows and establish that students need to find the value for each data name. Invite suggestions on ways they might find such data (school website, asking adults, observing).
* Focus on the data name devices with sensors. Invite suggestions on the term sensors and establish that sensors are devices that sense changes in a given field (light, temperature, movement) and make something happen when a change is sensed (**slide 5**).
* In small groups, ask students to go on the treasure hunt, visiting the appropriate part of the school to find the required information.
* Review their findings as a class, collecting the data by asking students questions such as, ‘what value did you have for the data name number of photocopiers? (**slide 6**). Discuss which was the most difficult data to find and why this was.

**Using sensors (10 minutes)**

* Discuss the devices with sensors that students found during their treasure hunt and ask them to suggest what sensors are used. If there were not any devices with sensors found, discuss common examples like automatic doors in shops, and automatic lighting and taps in toilets. Explain that they are going to focus on writing programs that use sensors with the micro:bit.
* Use **slide 7** to explain to students that the micro:bit has sensors that can be used to record data. Invite suggestions on what data the micro:bit could record and establish that it can sense movement, temperature, and light (the students will make use of the last two sensors in this unit).
* Show students the program on **slide 8** and ask them to predict what will happen when the program runs (remind students that they are using logical reasoning). Click on the [light sensor link](https://makecode.microbit.org/#editor) (image) in the presentation to open the program in the MakeCode editor and test students’ ideas. Establish that the micro:bit has been programed to display the light level recorded by the sensor.
* Recap that the colours of blocks can be used to locate the menu in which the blocks are located and identify the locations of the three blocks in the program.

**Collecting data with the micro:bit (30 minutes)**

* Explain to the students that you would like to find out the warmest and coldest area of the school. Invite suggestions as to where these places could be. Record places on a large sheet of paper and ask students, in pairs or larger groups, to identify five places from the list where they will record the temperature. Give out the temperature table and ask students to identify the places that they are going to record the temperature in (**slide 9**).
* Explain that students are going to use their micro:bits to record the temperature in different areas around the school. Display the program used earlier (either from the link on **slide 9** or by displaying **slide 10**) and invite suggestions on how this could be modified to show the temperature instead of the light level.
* Ask students to model how to download and transfer their programs to their micro:bits. Pose the question of how the micro:bits could be moved around and still used without being connected to the computer. Establish that the battery pack should be connected to the device to provide it with power (**slide 11**).
* Give students time to use the MakeCode editor to create a temperature recorder by modifying the given program. Once written and tested, ask students to download and transfer their program to their micro:bit which has been connected to a battery pack. An example of what this program will look like has been included with the lesson downloads.
* Give students sufficient time to visit the locations, use their micro:bits to identify the temperature and record it in their tables.

**What does our data show? (5 minutes)**

* Use **slide 12** to review the data students collected, and identify the warmest and coolest locations in the school. Explore any patterns in the results by identifying any similarities between the warmest/coolest locations. Identify any anomalies in the results and suggest reasons why (the micro:bit was being held on the temperature sensor, windows may have been opened or closed etc.).
* If you wish, use **slide 13** to review the lesson objectives.

**Extension ideas**

Students could produce graphs showing their temperature data collected.

**Differentiation**

**Support**

Provide students with microbit-temperature-support hex file which provides the required blocks for students to use to write their program.

**Stretch & challenge**

Students could record three temperatures at each location and identify the mean temperature for each location. They could also add comments to their program to identify the changes they have made and why.

**Opportunities for assessment**

* Informal assessment of students’ understanding of data and sensors through discussions and activities.
* More formal assessment of students’ programs.