# Lesson 30 – Air Quality Sensor

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| The Big Picture – Why is this Relevant? | Learning Objectives |
| * This lesson introduces a new device – the scroll:bit. The scroll:bit introduces the ability to utilise a larger screen to display more information to the user * Internet of Things (IoT) devices have to communicate with each other. This lesson will allow Learners to take readings from the enviro:bit sensors and send that data wirelessly to a second micro:bit which contains the display * A new data structure is introduced called an array. This allows multiple items of data to be stored under one data structure | * Understand how to program the scroll:bit * Use the **Radio** group to send data between two micro:bits * Understand the purpose of an array |
| Engagement – How Can I Engage Learners? | Assessment for Learning |
| * Learners will be able to work in pairs to develop an IoT device to measure air quality. They will link their devices so that one takes the measurements whilst the other displays the information. Users will enjoy working in pairs and be able to create a functional device * Learners will enjoy using the new larger screen that the scroll:bit provides. It is extremely bright and will be an extremely engaging activity * Learners will create holders to mount their devices | **Expected Progress:**   * Learners will be able to create a holder for their weather station and display * Learners will be able to create code to send data between two micro:bit devices * Learners will be able to program the scroll:bit to make use of the larger screen   **Good Progress:**   * Learners will understand the need to create a mount for the enviro:bit which leaves the sensors exposed * Learners will understand the need to be able to situate sensors away from the receiving screen to provide real world utility * Learners will understand the purpose of an array   **Exceptional Progress:**   * Learners will be able to write their own code to make use of the light sensors on the enviro:bit * Learners will be able to code the scroll:bit to display a different set of data when Button A or B is pressed by the user * Learners will understand how an array is structured and the logic behind being able to iterate through different data items |
| Key Concepts | Key Words |
| * To be able to make use of IoT devices they need to be able to communicate with each other. This needs to be done wirelessly to avoid the need for cables to be running around the room * The micro:bit radio group can be used to send data between separate devices * The in-built screen on the micro:bit is quite small. To improve usability a bigger screen can be used – this allows data to be more easily viewed by the user * An array can be used to store multiple items of data under a single identifier | * scroll:bit * enviro:bit * IoT * Radio communication * Sensor * Send * Receive * Array * Usability |
| Differentiation | Resources |
| More able Learners can explore the use of the light sensor and how this can be used to measure ambient light levels. They can explore how to display different pieces of data depending upon whether the user presses Button A or B. | * 1 micro:bit per learner * 1 USB cable to connect the micro:bit to a PC * A PC * Access to <https://makecode.microbit.org> * Lesson 30 ppt * scroll:bit and enviro:bit worksheet * 1 enivro:bit per pair * 1 scroll:bit per pair |
| Lesson Flow | |
| * Ask Learners to think about how data is communicated to the user on the micro:bit. Are there any limitations to how the data is displayed? Draw out that the screen is very small and so when displaying data, it can be difficult to follow. Ask Learners to think about LED screens that are used on trains and buses. How do they differ? The main different is the number of LEDs on the screen. This allows more data to be displayed at once. How well the device performs for its purpose is called ‘usability’ * Show Learners the scroll:bit and remind them of the enivro:bit. Introduce Learners to the scroll:bit. The scroll:bit has 119 LEDs. Introduce the items that they will be making – a weather station to measure air quality and a remote display to show the results. Learners should complete the making task, which is to design holders for the two devices. If allowing two lessons for this project allow Learners to spend the remainder of the lesson producing the holders. Stress the importance of usability * Ask Learners what they had to do to be able to program the enviro:bit. They should identify that they had to install the enviro:bit library. Learners should then identify that they will need to install the scroll:bit library in order to be able to write programs for it. Learners should then pair up. One learner should install the enviro:bit library whilst the other installs the scroll:bit library * Check that all Learners have installed the relevant libraries. It is important that Learners only have one of the two libraries installed. Introduce the main task to Learners. Learners will work in pairs to produce the air quality monitor. One learner will develop the code for the enviro:bit. That micro:bit will then send the data to the second micro:bit which the second learner will program. This will receive the data and then display the appropriate data on the scroll:bit. Ask Learners if they can remember how to send data between two micro:bits. More capable Learners may remember that the radio group enables this. The enviro:bit and scroll:bit worksheet talks Learners through the code that needs to be produced * The code for the scroll:bit introduces a new data structure called an array. Explain to student that when the sensor bit is triggered by the scroll:bit it will transmit three numbers. The array is going to hold the labels which will be displayed when the three numbers are transmitted. Use the ppt to support this discussion * Learners should code each of the micro:bits. One learner will program the scroll:bit whilst the other programs the enviro:bit. Learners need to remember to use the same radio channel in order for them to be able to communicate. * If there is time, more capable Learners should explore how to use the light sensor to measure ambient light levels. Learners can then write code so that the ambient light level is displayed when the B button is pressed | |
| Making | |
| * Learners should produce a holder for the scroll:bit and enviro:bit * This should be decorated appropriately remembering that it is air quality / weather conditions that are being measured * The person developing the enviro:bit holder should remember to leave the sensors exposed in order for accurate readings to be taken | |