# Lesson 3 – Air quality sensor and selection

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| The big picture – why is this relevant? | Learning objectives |
| * This project introduces the use of a sensor to monitor air quality * Smart homes are now becoming more prevalent and the programs and hardware used in these devices is similar to the Arduino * Different tasks need to be carried out depending on whether different conditions are true or false. When executing computer code, certain lines of code will only need to be run if a condition is true. This was represented as a diamond shape in the flow charts which learners studied in a previous lesson. In computer code, ‘if then else’ statements are used | * Understand what a **forever** loop does * Understand what the air quality sensor measures * Understand that if code is only to be executed if a condition is true then an ‘if then else’ statement can be used * Use a logical operator in a program * Consider what other applications the sensors could be used for in a product |
| Engagement – how can I engage learners? | Assessment for learning |
| * This project has real-world application and takes the concept into the world of Internet of Things (IoT) * The sensor could be used to monitor air quality at different times of the school day * Learners will use a number of real-world scenarios to demonstrate how different actions will need to take place depending on whether conditions are true or false * Encourage learners to think about how the sensors could be used to solve a problem or how to help a person or business | **Expected progress:**   * Learners will produce an air quality sensing program using selection and computational logic * Learners will understand the need for different pathways to be taken through programs depending on whether certain conditions are True or False and should be able to trace through given algorithms to determine the output   **Good progress:**   * Learners will adjust the program to suit their individual preferences * Learners will understand the need for ‘if, then, else’ statements to determine whether a line of code should be run. They will be able to trace through algorithms to determine outputs and create their own flow charts using decisions * Learners will be able to understand the data generated from the sensor   **Exceptional progress:**   * Learners will be able to use if then else statements appropriately within their code. They will understand that the else statement is needed as a ‘catch all’ to handle unexpected inputs without crashing * Learners will be able to interpret the data generated from the sensor and make recommendations on how to improve air quality |
| Key concepts: | Key words: |
| * Code will not always run line by line in the same order * At times certain lines of code will only need to be executed if a condition is true or false * Computer languages use if, then, else statements to take different pathways through programs * Computational logic | * Sensor * Analogue * Digital * Sequence * Selection * Condition * Breadboard * Connector carrier |
| Differentiation: | Resources: |
| Most learners will be able to follow the instructions however adding a program to a microcontroller maybe a new concept to some learners.  More capable learners will be able to create their own algorithms using their own if, then, else statements. They may be able to write a program to analyse the data generated from the sensor. | * Lesson 3 ppt * ‘Sensing your world’ worksheet * Lesson 3 Activity Sheet * Lesson 3 ‘If, then, else’ worksheet * Access to Arduino cloud * Arduino MKR 1000 * Arduino MKS Connector Carrier * Grove air quality sensor |
| Lesson flow | |
| * Using the PowerPoint presentation to support the discussion talk through the purpose and different types of sensor that exist * Introduce the concept of a **forever** loop * Introduce the Success Criteria for the sensing your world activity * Explain the logical operators if necessary * Show learners where the resources are on the PC * Learners work through the resources independently, and the teacher intervenes where appropriate. Any students who complete the task early can research what a solenoid is and attempt the stretch task * Encourage more advanced learners to attempt the stretch tasks once they complete the main task * The ‘Sensing your world’ task introduced students to endless loops. Learners should now be introduced to multi-level selection statements. Use the ppt to introduce if, then, else statements * Students should then complete the ‘If, then, else’ worksheet * Demonstrate how to attach the MKR1000 to the connector board * Discuss how the different sockets can be used which make devices more robust than using a basic breadboard * Demonstrate how to connect the Grove Air Quality sensor * Using the ppt as support, discuss what the sensor can measure: harmful gases such as carbon monoxide, alcohol, acetone, thinners or formaldehyde * Demonstrate the code structures required to initiate the sensor * Learners should then set up and program their sensor | |
| Making | |
| Learners should design a holder to hold the device while it is taking measurements throughout the day. It should be robust enough to protect the device and could be branded. It must be able to safely hold the connector board, MKR 1000, air quality sensor and battery. The recommended board uses a Wi-Fi connection so, when choosing a location to measure air quality, it must be within Wi-Fi range. | |