# Lesson 6 – BioDome project

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| 40BThe big picture – why is this relevant? | 41BLearning objectives: |
| This lesson introduces a couple of output devices along with a range of data recording options. As well as building a functional BioDome learners will also record data which can be analysed using the Python SciPy libraries. | * Create a circuit using a breadboard * Create a system to monitor and record environmental conditions within a planted bio dome * To turn input and output devices automatically on and off depending upon readings taken by a sensor |
| 42BEngagement – how can I engage learners? | 43BAssessment for learning |
| * Learners will enjoy building a functional BioDome which they can use to grow plants in * Learners will use new libraries with their Arduino to automate tasks * Learners will also build a couple of output devices which will be attached to a breadboard. They will enjoy building the electrical circuits | **Expected progress:**   * With support, learners will understand how to wire up a circuit to light up LEDs * Learners will be able to connect the MKR1000 and Env Shield to a breadboard   **Good progress:**   * Learners will be able to independently build circuits on a breadboard to turn on 2 bright white LEDs * Learners will be able to create code which will turn on the LEDs using electronic switches * Learners will be able to record a variety of readings from different sensors   **Exceptional progress:**   * Learners will be able to independently write code to analyse the data recorded by the MKR Env Shield * Learners will be able to create code to turn LEDs on and off at specific times of the day |
| 44BKey concepts: | 45BKey words: |
| * Learners will be able to use a range of input and output devices * A breadboard can be used to create a range of circuits * The elements on the breadboard can be controlled using inputs from a cloud dashboard | * Input * Output * Breadboard * Motor * Sensors * MKR Env Shield |
| 46BDifferentiation: | 47BResources: |
| More able learners should be able to implement the skills learned from Lesson 6 to analyse the data recordings taken by the Env Shield. | * .ppt * Arduino MKR 1000 * Breadboard * MKR Env Shield * Bright white LEDs * Resistors * Motor * Fan blade for motor * Plants / seeds and soil * Plastic bottle * Cardboard or plywood for plastic bottle lid * SD card (optional) * Arduino MKR 1000 * Breadboard * MKR Env Shield * Bright white LEDs * Resistors * Motor * Fan blade for motor * SD card (optional) |
| Lesson flow | |
| * Introduce learners to the project. They will be building a BioDome which they will use to grow plants and monitor the environmental conditions. * Introduce learners to the breadboard concept. To date, learners will have built devices using the MKR series of modules. The breadboard allows more flexibility. In this project the breadboard will hold 2 bright white LEDs and a motor. * Demonstrate to learners how to wire up the breadboard to hold two LEDs. Learners should then create this circuit. Inform learners that this module will be mounted to the top of the BioDome to provide light for photosynthesis to occur within the dome. * Talk learners through the code to control both the LEDs. Initially the LEDs should be set to be turned on all the time. * Talk learners through the code to take readings from the Env Shield. * Learners should then explore the possibilities that the MKR Env Shield offers. They should use the Internet to research which sensors it contains. Learners should then feedback and discuss how these readings could be used to control the environment. * Demonstrate the code that is needed to take readings from the various sensors. Once the device is connected to a dashboard on the Arduino cloud historical readings from each of the sensors can be downloaded onto a CSV file. * Learners should then create a new thing. They should work through the worksheet to add their code which controls the LEDs and Env Bit so that it becomes an integrated program. The worksheet will talk them all the way through the project and includes creation of the dashboard which is accessible on the Internet. * More capable learners could create code to turn LEDs on and off depending upon ambient light levels. Learners may also wish to explore adding a motor with a fan blade attached to circulate the air. | |
| Making | |
| * Once learners have created and coded their device, they should then build their BioDome. The basis of the dome could be a plastic soda bottle. Cut the top of the bottle about two thirds of the way down. This will then present an accessible area to add the soil. Learners should then add a plant or seeds to the soil. * A lid should now be created to seal the unit. This lid should have a couple of vent holes and will also hold the MKR 1000 board, breadboard and Env Shield. The fan should be mounted on the underside of the lid so that it can circulate the air. * The Env Shield sensors must be exposed to the inside of the BioDome. The LEDs must also be exposed to the inside of the Dome so that it can provide light. Once learners have developed a suitable lid the core circuits can then be secured. This could be sealed using cardboard which could also be branded. | |