# Lesson plan - Lesson 6 modify and make

## Using the MonkMakes solar experimenters kit

## Introduction

In the preceding five lessons you had time to introduce the four circuits and two programs to the students. During the scheme they have learned about decomposition, user-defined functions, types of loops and pseudocode. During this lesson the students will be invited to modify the most recent “Intelligent cooling fan” program and make one of their own design, using the skills of pseudocode writing and decomposition that they have developed earlier.

Learning objectives

* To successfully set up a micro:bit/intelligent cooling fan circuit and flash code to the micro:bit
* To be able to successfully modify a program containing multiple programming constructs
* To be able to successfully make a program containing multiple programming constructs
* To answer questions about the solar store and programming constructs and concepts

## Keywords

Solar store, voltage, super-capacitor, terminals, bulb, harvested, circuit, GPIO, pins, iteration, loops, trace tables, testing, algorithm, functions, modify

## Preparation

**Subject knowledge:**

This lesson is suitable for a class who already has a basic knowledge of programming using python, having previously used functions and iteration in programs. In addition this lesson is the last in the scheme. Both the starter and plenary quiz and crossword require knowledge which has been developed during the previous five lessons. The coding for the micro:bit is written in a reduced version\* of python called micropython but for practical purposes the syntax will appear the same to the user. In addition the students should have already used the micro:bit, practising simple set up and smaller micro:bit specific programs so that they are used to building and flashing programs. Initially, building the circuit for the “intelligent cooling fan” is a question of copying a diagram so a practical demonstration of handling the components gently and clipping with alligator clips would suffice.

**Pedagogical approach:**

The scheme is planned using the PRIMM pedagogy which stands for:

P - Predict

R - Run

I - Investigate

M - Modify

M - Make

For this reason it is important that the class have quick and easy access to the coding of the “Intelligent cooling fan” program which can be accessed via: https://tinyurl.com/2wtkdh2d.

This specific lesson focuses on the Modify and Make parts of PRIMM, though your students still need access to the coding for the previous projects in order to modify them.

**Practical set-up and development environment:**

We recommend either using the on-line Python editor (https://python.microbit.org) or Mu (https://codewith.mu). Or you could manage your coding in micro:bit’s own environment <https://classroom.microbit.org/> which enables you to push code to the whole class and manage their activities.

**Resources that you need:**

* Presentation
* Starter worksheet questions
* Starter worksheet answers
* Code conversation full solution
* Code conversation template (level 1 - basic)
* Code conversation template (level 2 - intermediate)
* Plenary worksheet
* Plenary worksheet answers
* Hardware Per pair - 1 micro:bit, 1 Solar panel, 1 Solar store, 1 USB/micro USB cable, 8 alligator clip leads, 1 motor, 1 fan
* Access to appropriate development environment (the on-line Python editor, Mu or micro:bit classroom)

## How the students’ progress is assessed

The lesson begins with a worksheet which encourages the students to list possible modifications to the intelligent cooling fan and to suggest other new programs which they could create using the solar experimenters kit. This gives you an opportunity to assess whether they can correctly identify and achieve possible small modifications and new program concepts. The lesson is interspersed with pair or whole class discussion opportunities. As this is predominantly a practical lesson, observing the students’ success in flashing the program, compiling the circuit and making small successful modifications to the program will also enable you to assess their progress. The learners also complete a worksheet at the end of the lesson which demonstrates their understanding of key principles conveyed during the whole scheme which is presented in crossword form.

## Plan (with approximate timings)

| Starter activity 7 mins | **Modify and Make worksheet**  The slide that greets the student is inviting them to complete the Modify and Make worksheet. The worksheet suggests that the students work in pairs and decide what modifications they could make to the program. If you circulate the class and some are struggling to suggest any modifications there is an answer Modify and Make worksheet with some suggestions. |
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| Activity 1 8 mins | **Circuit and code**  Compile the intelligent cooling fan circuit and flash the code to the micro:bit. It is recommended to move onto this section in the program quickly to give enough time for some charge to build up in the solar store so that the functionality of the program can be observed. |
| Activity 2 30 mins | **Modifying the program**  The students are invited to modify the intelligent cooling fan project. As a class, review the purpose of the program and ask the students to say what modifications they are planning to make to their program. Encourage them to start small and only change things that they are confident will keep the basic functionality working. |
| Activity 3 10 mins | **Making a new program**  The students are invited to make a new project using the solar experimenters kit. They are shown a slide with the Carl Sagan quote “If you wish to make an apple pie from scratch you must first invent the universe” to emphasise that it is usual practice amongst programmers to use functions or code snippets from other programs. So, they should not feel that their program has to be created from scratch, there may be some functions that can be repurposed from the other two programs in this scheme. |
| **Plenary**  10 mins | **Scheme crossword quiz**  Students complete the plenary worksheet testing knowledge from the whole scheme. |
| **Homework** | **Last lesson in scheme, no homework set.** |

## The Author

This lesson plan and all its parts were created by Dr. Paula Beer of Beer Academic Consultancy in collaboration with Monk Makes Ltd.



Dr Paula Beer has taught Computer Science and IT education to new and established teachers since 2007. Her own research has focused on the use of play and collaboration in computer science. She enjoys supporting practicing teachers by designing accessible lesson planning materials to get students engaged in computer science through play and collaboration. Paula has also produced educational materials for The Raspberry Pi Foundation, been a secondary school teacher, written a successful book (Hello App Inventor!) and has previously worked in IT project management for a media company and for the NHS.