# Lesson plan - Lesson 5 Intelligent cooling fan part II

## Using the MonkMakes solar experimenters kit

## Introduction

In lesson four you had time to introduce the intelligent cooling fan to the students. The students also discussed the overall aim of the program and began to investigate the code, using the code conversation template. During lesson six the students will complete the code conversation in preparation for the last lesson in the scheme by which time the students will be able to complete the last part of the PRIMM cycle in modifying and making a new circuit and program.

Learning objectives

* To successfully set up a micro:bit/intelligent cooling fan circuit and flash code to the micro:bit
* To be able to read and interpret a program containing user defined functions
* To understand the purpose of decomposition
* To successfully apply decomposition to a range of problems

## Keywords

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

## 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. 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 lesson 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 program which can be accessed via: https://tinyurl.com/2wtkdh2d

The very first step is for the students to view the code and attempt to predict what the code does. We use a tool called a **code conversation** which provides the teacher with a conversation style **talkthrough** of the micropython code for you to support your students’ developing knowledge. Occasionally daggers (††) are used to clarify things in the code conversations, instead of asterisks, which could be confused with the multiply symbol.

**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

**Intelligent cooling fan II**

The lesson begins with a set of questions relating to real life examples of decomposition. The students are challenged to suggest manageable steps in the process of solving various problems or achieving activities. A worked example is provided as part of the worksheet, to give them an idea of the level of detail that is expected. 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 lesson. Because of the complexity of the circuit and the need to leave some time for charging, the lesson is split into two with the code conversation started in part I and completed in part II with time left for the modification and make part of the PRIMM methodology in the final lesson of the scheme..

## Plan (with approximate timings)

| Starter activity 8 mins | **Decomposition scenario question worksheets**  The slide that greets the student is inviting them to complete the decomposition scenario question worksheet. After the students have completed the worksheet, quickly go through the solutions. The answers are very individual to the students, so there isn’t strictly a right or wrong answer. What you are looking for is students’ engagement with the task and that they have understood the concept of breaking down complex tasks into manageable chunks. |
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| Activity 1 10 mins | **Decomposition explanation and demonstration**  The “eating an elephant” analogy is shared with the students and the process of decomposing the intelligent cooling fan program is broken down. The students are asked to work in pairs and (using the code conversation) asked to suggest what the parts of the intelligent cooling fan program are. |
| **Activity 2**  8 mins | **Run: students compile the circuit, flash and run the code**  Share the slide with instructions on the board to enable the students to build the circuit, flash and run the code. |
| Activity 3 10 mins | **Investigate (part II): teacher and students use correct terminology to identify the syntax and features of the program**  Using the A4 worksheet, the learners attempt to complete the second part of the code conversation matching the correct explanation to each line of code.  Using the slides, talk through the different steps in the program. |
| **Plenary**  6 mins | **Intelligent fan plenary worksheet**  Students complete the plenary worksheet testing knowledge of decomposition |
| **Homework** | **Look back through the resources (slide decks and worksheets) in preparation for a summative assessment in the final lesson.** |

## 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.