## Introduction

This unit introduces children to flowcharts and how they are used to program and control devices. Lessons are designed to be used with Flowol software (version 4.0), which includes simulations of real life automatic computer systems. Children are taught to build sequences of instructions, control multiple outputs and structure algorithms with decisions and inputs. Although many external hardware interfaces can be attached and linked to a computer using Flowol, this unit is designed as an introduction to the software and the concepts of flowchart programming. Further learning can be extended by using external devices.

Health & Safety

General safety in using a computer and e-safety rules, particularly if accessing the Internet. Encourage good posture when sitting at the computer.
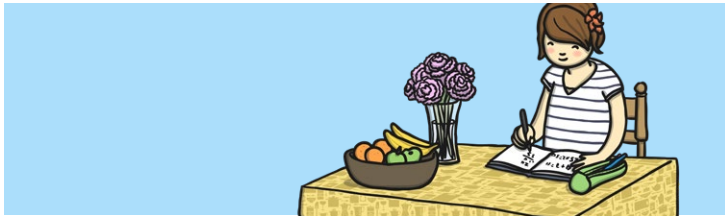
Home Learning

Design Your Own Flowchart: This task is best used after lessons 1 or 2 to help children plan and develop their own flowcharts. This can be done using pen and paper without the need for a computer or specific software. Children create instructions for any task of their choice and use conventional symbols to draw a corresponding flowchart.

Controlling an Automatic Greenhouse: This task is best used after lessons 4 or 5 when children have gained further understanding of more complex flowcharts. It can be done without the need for a computer or specific software, but children may want to research ideal growing conditions for a greenhouse. Instructions need to be planned for the control of an automated greenhouse to adapt its conditions based on inputs of temperature and light, by changing outputs such as a heater and sprinkler. Pen and paper are used to draw a corresponding flowchart.

Assessment Statements

By the end of this unit…

…all children should be able to:

- Follow written instructions to draw a simple flowchart.
- Insert symbols into a flowchart.
- Add inputs into a flowchart.
- Identify conventional symbols, understanding the process of each stage.

…most children will be able to:

- Create a program to control a simple sequence.
- Modify symbols in a flowchart for effect.
- Create flowcharts for multiple inputs and outputs.
- Use decisions and subroutines.
- Program inputs and outputs.

…some children will be able to:

- Solve a given problem independently with a flowchart solution, organized into multiple subroutines.
- Create a program to control a sequence with variables.

Lesson Breakdown

Resources

1. What is a Flowchart?

Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts.

Use sequence, selection, and repetition in programs; work with variables and various forms of input and output. Children are introduced to flowcharts and practise reading them as a sequence of instructions, then designing their own.

- I can draw and interpret a flowchart with the correct symbols.

- This lesson does not require the use of a computer or laptop.

2. Programming Outputs

See above.

Children use the control software (Flowol) to create a simple flowchart for a zebra crossing, then learn how to edit, delete and insert new symbols.

- I can create and edit a flowchart to control a simulated device.

- Computer with Flowol 4 software

3. Multiple Outputs

See above.

Children control a simulated pair of traffic lights in sequence, which must run simultaneously.

- I can control multiple outputs at the same time.

- Computer with Flowol 4 software

4. Inputs and Decisions

See above.

Children deconstruct and then recreate a flowchart using a decision symbol, based on the input of the sunlight at a lighthouse.

- I can use a decision symbol based on the status of an input.

- Computer with Flowol 4 software

5. Subroutines

See above.

Children are introduced to the concept of subroutines by editing an already familiar flowchart (Lighthouse).

- I can create a flowchart program containing a subroutine.

- Computer with Flowol 4 software

6. Combining Skills

See above.

Children are introduced to a new scenario (Robot toy) for which they must design and create their own programming solution. This should involve one or more inputs controlling one or more outputs. Some children will be able to include subroutines for clearer organisation.

- I can design, write and debug my own flowchart program for a given task.

- Computer with Flowol 4 software