



Unit 6C: Control and monitoring - What happens when...?

About this Unit:

In this unit children learn how to use input devices or switches to control a process. They learn that it is possible to attach devices such as pressure pads, light sensors, magnetic switches, on/off switches or other devices to a control box. The computer can then be programmed to carry out a process when it detects some sort of change, *e.g. switch on the light when it gets dark*. They learn the new control language necessary to program the control box to make such decisions, *e.g. 'if... then...'*

Where this Unit fits in:

This unit assumes children:

- know about procedures
- can program output devices

The unit builds on Unit 5 'Controlling devices'.

Vocabulary:

If | Then | Until

Resources:

control box | output devices, such as bulbs, small motors and buzzers
| input devices, such as pressure pads and light sensors

Expectations: at the end of this unit,

Most pupils will be able to: produce simple procedures to turn on lights and sound alarms; need help with their program and will need to make amendments.

Some pupils will only be able to: have difficulty producing procedures; need help to get the logic correct; need to correct work frequently.

Some pupils will also be able to: produce procedures without difficulty; string procedures together; recognise patterns in programming; recognise the weaknesses of the system.

These units have been adapted from material available on the QCA Schemes of Work website



Learning Objectives <i>Pupils should learn...</i>	Possible Activities	Learning Outcomes <i>Pupils can...</i>	Consider
<p>Setting the Scene</p> <ul style="list-style-type: none"> • key idea: that computers can monitor physical factors. • Discuss with the class how a variety of cause and effect devices work, <i>e.g. central heating, security lights, road lights, supermarket freezers</i>. Talk about how the environment is monitored constantly to check if changes have occurred, <i>e.g. when it gets cold the heating comes on, or street lights come on when it gets dark</i>. Discuss the difference between a timed event and an event that occurs as a result of measuring physical change. Ask the children to identify three systems that use monitoring to control events. Ask them to write a simple description of how each system might work. • Learn that devices can monitor physical changes. • That devices cause an event to happen when a change occurs. • Discuss the difference between timed events and events that occur as a result of a physical change, such as temperature, light or sound. 			
<ul style="list-style-type: none"> • key idea: that a switch can cause an event to occur • technique: to use 'If ...then...' and 'repeat forever' • Remind the pupils of the simple procedure used to make a light bulb come on. Explain that the computer is going to have an input device added to it - in this case a simple switch. When the switch is pressed the light bulb will come on. The children will need to understand the concept of an endless loop - repeat forever - because the computer has to check continually if the switch has been pressed. Write a simple procedure with the children to produce this effect, <i>e.g.</i> <pre>repeat forever if Input 1 on then lamp end repeat (where lamp is a simple procedure to turn on the bulb, wait two seconds and switch it off).</pre> • Ask the class to work in small groups to check that the bulb always comes on when the switch is pressed. • Learn that an input device can be used to cause an event. • This type of switch is not the same as a light switch or on/off switch since it causes a procedure to occur. Extend the lesson by making the procedure 'lamp' more complex. 			

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Learning Objectives <i>Pupils should learn...</i>	Possible Activities	Learning Outcomes <i>Pupils can...</i>	Consider
Short Focused Tasks (Cont.)			
<ul style="list-style-type: none">• key idea: that a light sensor can monitor light and dark and trigger an event.• technique: to use a light sensor.	<ul style="list-style-type: none">• Repeat the previous lesson but use a light meter to monitor light and darkness. Ask the children to design a simple lighthouse using a bulb, a cardboard tube and a light sensor. Tell the children they are now going to make their lighthouse work.• Ask the children to write a procedure to make the light bulb flash every second. Ask the children to draw a diagram of their lighthouse and show where the wires are plugged into the control box. Allow them to test and amend their procedures. Now ask them to use the light sensor to make the sequence occur when it is dark and not when it is light.	<ul style="list-style-type: none">• Learn how to write a procedure to check two inputs and an output event.	<ul style="list-style-type: none">• Children who find this activity difficult should only try to turn on the bulb when it gets dark. Children who find the work easy could vary the sequence of flashes to include a Morse code message.
<ul style="list-style-type: none">• key idea: that more than one input device can be used.• technique: to use and program two input sockets.	<ul style="list-style-type: none">• Discuss how automatic doors sometimes operate using pressure pads. Explain that when something comes in contact with the pads, they send a signal to a motor which opens the doors. When pressure is taken off the pads the doors close. Describe the other input devices used to control doors, <i>eg light beams and heat sensors</i>. Ask the children to describe a system, draw a picture and then write two procedures to open and close a door. Allow the children to enter their procedures, test and modify them.	<ul style="list-style-type: none">• Learn how to use two input devices.	<ul style="list-style-type: none">• If you do not have pressure pads this activity could be simulated by using another input device, such as a tilt switch or a magnetic switch.

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Assessment Task			
<ul style="list-style-type: none">• To develop a system that controls events in response to conditions.	<ul style="list-style-type: none">• Explain to the class that they are going to make a house security system with a floodlight and house lights that come on after dark and go off in the morning, a window alarm based on a magnetic switch, a door alarm based on a pressure pad and a burglar alarm with a loud buzzer and flashing lights.• Ask the children to work in groups to build a model of a house with a variety of input and output devices attached. This could just be the front façade, built out of cardboard or other material. The house will need a floodlight and light sensor outside and lights at one or more windows inside. The front door will need a pressure pad under the door mat and the window will need a magnetic switch. Both door and window will need to open. There should be a coloured light and buzzer on the front of the house marked 'alarm'.• Ask each group to write a sequence of instructions to switch lights on at night and off in the morning and for the alarms to sound if the door or window is opened. They should write separate sequences for each event, not try to combine them all. Ask them to record their programs, draw and annotate a diagram and describe the results.	<ul style="list-style-type: none">• Use input and output devices and produce a simple set of instructions linking causes and effects.	

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