

## Unit 6 Control: input, process and output

### About the unit

In this unit pupils learn about control technology through modelling the working of a car park barrier. Pupils program a simple cause and effect model, *eg pressing an input switch that produces an output, such as sounding an alarm*, and develop their knowledge and understanding of control devices by solving a problem using procedures as building blocks. They refine instructions and learn how the order in which instructions are given will be critical to the success of the project. It is important that during this unit pupils use a structured approach to solving this type of problem.

The idea that a counter is used as a control mechanism is important, because it has many applications to everyday life. Pupils also develop their understanding of how criteria are used to make judgements about the success of their projects and areas of development.

This unit is expected to take approximately 5 hours.

### Where the unit fits in

This unit builds on the activities carried out in unit 5E ‘Controlling devices’ and unit 6C ‘Control and monitoring – What happens when...?’ in the key stage 2 scheme of work.

### Expectations

#### At the end of this unit

**most pupils will:** write a sequence of instructions that control events and understand that the order in which instructions are executed is important; explore the effects of changing variables in an ICT-based model; discuss the use of ICT outside school and make judgements about its use in their work

**some pupils will not have made so much progress and will:** write a solution that will raise and lower the barrier by giving instructions in a predetermined sequence; compare the use of ICT with other methods and how it is used outside school

**some pupils will have progressed further and will:** refine the instructions within a program so that they are carried out efficiently and economically; make judgements about their overall project and understand the areas that need to be developed after applying criteria they have identified; demonstrate a deeper understanding of how such developments have implications for society

### Prior learning

It is helpful if pupils have:

- understood procedures and what they are called
- controlled output devices

### Language for learning

Through the activities in this unit pupils will be able to understand, use and spell correctly vocabulary relating to:

- models, *eg flow diagram*
- cause and effect models, *eg input, input device, output, output device, proximity switch*
- programming, *eg IF–THEN REPEAT–UNTIL, procedure*

Speaking and listening – through the activities pupils could:

- organise, sequence and link what they say so listeners can follow it
- identify the main points of a presentation

### Resources

Resources include:

- one or more control boxes
- output devices – motors, lights, buzzers
- input devices – proximity switch, tilt switch, two press switches
- control software

Pupils should learn:

Pupils:

### Activity 1

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| <ul style="list-style-type: none"> <li>• that inputs can cause events to happen in a predetermined manner</li> <li>• that counters can be used as controls</li> </ul> | <ul style="list-style-type: none"> <li>• Explain to the class the rules for the car park barrier. As a car approaches the barrier it will be detected and as soon as a ticket is taken the barrier is raised. The capacity of the car park is limited, so a count is kept of how many cars have entered. When the maximum number of spaces available have been filled, a full sign is lit up. As a car leaves the car park, the counter is reduced accordingly and the full sign (if lit) is turned off.</li> <li>• Discuss with the class various input and output devices and where they may be found. As an introduction, a video that illustrates inputs and the resultant outputs could be used. This provides an opportunity for pupils to identify the main points from a video presentation.</li> <li>• Revise simple cause and effect, <i>eg press a switch and sound an alarm</i>. Allow pupils to experiment with altering the speed of a motor.</li> <li>• Demonstrate how inputs are used to affect the value in counters.</li> </ul> | <ul style="list-style-type: none"> <li>• describe inputs that can cause an event to happen</li> <li>• use counters as controls</li> </ul> | <ul style="list-style-type: none"> <li>• Other cause and effect items include ticket barriers, pelican crossings, doors that open automatically, bar code readers, car park barriers.</li> <li>• Videos showing cause and effect could be used to demonstrate feedback. These could include, <i>eg automated factories, theme park rides, etc.</i></li> <li>• After showing the video try to bring out that there is an input, <i>eg a light beam – the cause</i>, and an output, <i>eg doors opening – the effect</i>.</li> <li>• Homework could involve pupils finding other examples of cause and effect.</li> <li>• Show how to set up a counter (this can be another input), and how inputs can affect the value within a counter.</li> </ul> |
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### Activity 2

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| <ul style="list-style-type: none"> <li>• that flow diagrams help to model a project graphically</li> <li>• to introduce success criteria</li> </ul> | <ul style="list-style-type: none"> <li>• Introduce flow diagrams and counters to the class.</li> <li>• Plan with the whole group how the project will be managed. Identify success criteria.</li> </ul> | <ul style="list-style-type: none"> <li>• use a flow diagram to graphically model their solution to a problem</li> </ul> | <ul style="list-style-type: none"> <li>• Introduce flow diagrams by considering the items discussed in activity 1.</li> <li>• Introduce success criteria – how will the project be judged as being successful?</li> <li>• Homework could involve pupils drawing a flow diagram demonstrating how the problem will be solved. They could also identify additional criteria that will be applied to the project.</li> </ul> |
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**Learning objectives**

Pupils should learn:

**Possible teaching activities****Learning outcomes**

Pupils:

**Points to note****Activity 3**

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| <ul style="list-style-type: none"> <li>• that programs are built by using procedures as building blocks</li> <li>• that programs are improved by testing the results of the building blocks</li> </ul> | <ul style="list-style-type: none"> <li>• Ask pupils to write procedures as individual building blocks and then build a program from the procedures.</li> <li>• Ask pupils to test and refine the program and consider possible extensions.</li> </ul> | <ul style="list-style-type: none"> <li>• write a procedure as a building block</li> <li>• build a program from a number of procedures</li> <li>• test and refine a program to achieve the intended outcome</li> </ul> | <ul style="list-style-type: none"> <li>• During this activity revise procedures used as building blocks. Pupils build, test and refine their projects.</li> <li>• Extension activity: more able pupils will use more checks and refinements.</li> <li>• Homework could involve pupils refining their project plans and introducing changes as a result of tests.</li> </ul> |
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**Activity 4**

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| <ul style="list-style-type: none"> <li>• how to evaluate a project by considering criteria</li> <li>• to organise, sequence and link what they say so listeners can follow it</li> </ul> | <ul style="list-style-type: none"> <li>• Ask pupils to demonstrate their finished project. Ask them how they would identify successes and areas for development and how their solution can be used in the outside world.</li> </ul> | <ul style="list-style-type: none"> <li>• evaluate the project outcomes using selected criteria as the basis for making judgements</li> <li>• give a clear explanation of what they have learnt</li> </ul> | <ul style="list-style-type: none"> <li>• Pupils should consider the project as a whole and say what went well and why, and what improvements they would make (with reasons) after applying the success criteria.</li> </ul> |
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