Unit 5E Controlling devices

ABOUT THE UNIT

In this unit children learn how to control simple devices, such as buzzers, small motors and lights, using basic control boxes. They learn how to control devices by turning them on and off according to a set of instructions. This will be developed so that children understand how to sequence a set of instructions to get a desired outcome.

They will apply what they have learnt in this unit when learning about the built environment, for example traffic lights, or simple manufacturing processes.

WHERE THE UNIT FITS IN

This unit builds on Unit 4E 'Modelling effects on screen'.
This unit assumes that children understand procedures.

TECHNICAL VOCABULARY

- switch on
- wait
- switch off
- repeat
- procedures

RESOURCES

- control box
- simple switches and output devices such as buzzers, lights and small motors

EXPECTATIONS

at the end of this unit

most children will:	design and create a simple advertising display which produces a combination of events; write simple procedures and be able to link output devices together; amend their procedures to get a desired outcome
some children will not have made so much progress and will:	design and create a simple advertising display which produces a limited number of events; need help to write simple procedures and design the display
some children will have progressed further and will:	design and create an imaginative advertising display which produces a combination of events; write, correct and improve procedures to link output devices together; realise the limitations of the system

YEAR 5

QCA

LEARNING OBJECTIVES	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES	POINTS TO NOTE
SETTING THE SCENE			
CHILDREN SHOULD LEARN		CHILDREN	
• **key idea:** that devices can be controlled through direct instructions	◆ Explain to the class that a number of everyday devices rely on simple control features to make them operate. Some of these devices rely on a single instruction, for example a barrier in a car park where money or a ticket will make it operate. Other devices rely on a sequence of instructions to operate, for example a pelican crossing where a button activates the lights then the walk signal. ◆ Ask the class to identify the devices at home and at school that operate on instructions and discuss whether they rely on a single instruction or on a sequence.	• recognise that control technology is all around them and that things do not happen without cause and effect • recognise that these devices rely on a set of instructions that can be repeated	Discussion with the children is likely to focus on who or what makes things work 'automatically'. It is important to discuss why machines do some things and not people: what are the advantages and disadvantages? A good example is what would happen if the school replaced their 'lollipop' person with a pelican crossing. Children could discuss safety, economy and efficiency.
SHORT FOCUSED TASKS			
• **key idea:** that a control box and software can be used to control an output device • **technique:** to control simple devices, such as small motors, light bulbs, buzzers, by giving direct instructions	◆ Introduce the children to the control box and show them how to plug a light bulb into output socket 1. Explain that the light can be switched on and off using a control language, for example 'switch on 1' turns the light on, 'switch off 1' turns the light off. Show the children that the command relates to the socket in which a device is plugged, for example if the bulb was in socket 3 the command would be 'switch on 3'. Demonstrate setting up a procedure to flash the light. Demonstrate repeat commands and name the procedure. Introduce the idea of using sensible names for procedures so that everyone will have an idea what they do. Call the procedure to make the bulb flash 'flash'. Divide the children into pairs and ask them to write their own procedures to flash a light bulb and sound a buzzer in short bursts. Children should record their procedures and describe the effects.	• recognise that devices can be controlled by a computer • recognise the need for precision when writing simple procedures	This procedure will involve using a wait command and timings. This should be related to the work done on LOGO in Unit 4E. Children will also need to know how to edit their procedures. Discuss accuracy of timing and language and how inaccuracy can lead to incorrect results. Children who find this work easy could use a simple model of a motor and barrier, and write a procedure to raise and lower the barrier. They will need to understand that the barrier is raised by the motor going forward, and lowered when the motor goes backwards. They will need to be shown how to slow down the motor. Children will need to know that there is more than one output socket and that the computer needs to know, through the language, which socket an output device is plugged into. Activities should be related to 'real life' situations where possible.
• **key idea:** to control more than one output device • **techniques:** to use simple procedures to control more than one output device • to use simple control language to activate multiple devices concurrently	◆ Show the class a simple traffic light set-up, using a pre-built model or three different coloured bulbs, and discuss the sequence of lights. Ask the children to work in pairs to produce a story board of a pelican crossing. The storyboard should show the lights before, during and after the button is pressed ◆ Ask each pair to write the control language to produce the correct sequence. They will need to use language learnt in the previous exercise and will need to know how to turn on more than one output at a time, for example to produce red and amber at the same time. Children should be encouraged to write separate small procedures for each part of the sequence, for example stop, wait and go. The children should then enter and test their procedure on the computer. They should record any amendments and describe the results. Finally, ask them to get the computer to repeat the sequence a number of times.	• write a sequence to produce a recognisable event • recognise the need for precision when writing a number of procedures in one sequence of instructions	Discuss what happens at a junction with more than one set of lights. What would happen if a procedure allowed all cars to go at the same time at a set of crossroads? Also discuss the difference between a set of lights and a pelican crossing, for example a pedestrian pressing the button.
• **technique:** to control output devices, by building a sequence of events, to solve a problem	◆ Write a program which will turn the classroom heater on before the children arrive in the morning, off at lunch, on again after lunch and off when they all go home. Give the children a set of simple instructions for the heater and ask them to predict what the instructions will do. Also ask them to identify errors or omissions in the sequence which might lead to problems in turning the heating on and off.	• recognise that there are consequences when machines, events or devices are controlled	Discuss whether the results of control technology are always beneficial, for example when things go wrong.
INTEGRATED TASK			
• to create a sequence of instructions which can control a number of output devices	◆ Explain to the class how an advertising display sometimes uses coloured lights and buzzers to draw attention to the product being sold, for example a fairground ticket machine. Tell the class that they are going to work in small groups to create their own advertising display with lights, buzzers and a small motor. ◆ Give each group a control box, the output devices and the appropriate leads and ask them to think about what sequence their display will perform. Children should storyboard the sequence and produce, test and compare three different displays. ◆ Ask children to programme their sequences and discuss how they might 'tidy up' any small procedures.	• sequence instructions to control a number of output devices	The success of this activity is based on children's ability to relate what they have done in smaller tasks with a much larger, and probably interconnected, set of devices and procedures which will impact on each other. If children find the activity difficult, limit the number of output devices to avoid complicated programming; two buzzers, up to four lights and one motor is recommended.

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