

ABOUT THE UNIT

In this unit, children develop an understanding of simple electrical control through the designing and making of an alarm system. They are also introduced to the idea of feedback. The designing and making assignment involves an alarm system to protect a valuable artefact which has been brought into the classroom.

PRIOR LEARNING

It is helpful if the children have:

- used construction materials eg wood, card and appropriate adhesives
- built simple series electric circuits and rectified faults that occur
- learnt how the components work and used simple tools required to connect these together

This unit builds on Units 2A ‘Vehicles’, 2C ‘Winding up’ and 3C ‘Moving monsters’.

It also builds on Science Units 2F ‘Using electricity’ and 4F ‘Circuits and conductors’, which focus on using electricity, electric circuits and conductors.

VOCABULARY

In this unit, children will use words and phrases relating to:

- designing eg *prototype, labelled drawings, communicate, model*
- making eg *join, circuit, alarm, rectify fault, connection*
- knowledge and understanding eg *circuit, toggle switch, push-to-break, push-to-make, reed switch, tilt switch, rocker switch, slide switch, micro switch, feedback, am, pm, timer, control, sensor, input, output, switch on/off, wait*

RESOURCES

- press switch, toggle or rocker switch, slide switch, push-to-make switch, push-to-break switch, reed switch and magnet, tilt switch (non mercury), micro switch
- buzzer
- lamp, lamp holder
- LED (light emitting diode), batteries, battery holder, battery clip
- wood, card, coloured paper, fabrics
- adhesives
- suitable control program

EXPECTATIONS

at the end of this unit

most children will:

have drawn on their understanding of simple electrical circuits and switches to help them generate ideas about their alarm; have produced a labelled drawing to communicate their ideas to others; have joined components and cut and shaped materials with some precision to help assembly; have joined the materials of their device using a range of appropriate techniques

some children will not have made so much progress and will:

have needed support to identify the specific purpose for their alarm; have used given techniques and tools to create their product

some children will have progressed further and will:

have evaluated their alarm system by comparing it with their design intentions and suggested ways of improving it

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
INVESTIGATIVE, DISASSEMBLY AND EVALUATIVE ACTIVITIES (IDEAs)			
<ul style="list-style-type: none"> • what alarm systems are used for • never to use mains electricity in their work • the ways in which different types of switches can be activated 	<ul style="list-style-type: none"> ∇ Discuss examples of alarm systems – where and why they are used <i>eg to provide information, to warn of danger, to prevent damage, to keep things safe.</i> ∅ Remind children of the dangers of mains electricity. ∅ Ask children to investigate some examples of commercially produced switches which work in different ways <i>eg slide, reed, tilt, push-to-make, push-to-break.</i> Let the children take these apart where appropriate to see how they work, and use them in simple circuits. Talk about how different types of switches might be useful in different types of alarm systems. 	<ul style="list-style-type: none"> • recognise the uses to which alarm systems can be put • understand the dangers of mains electricity • understand that different switches work in different ways 	<p>Links to this unit</p> <p>Design and technology: Units 6C ‘Fairground’, 6D ‘Controllable vehicles’</p> <p>Science: Unit 6G ‘Changing circuits’ (short unit)</p> <p>Information technology: Units 3A ‘Combining text and graphics’, 5E ‘Controlling devices’, 6C ‘Control and monitoring – What happens when ...?’</p> <p>Mathematics: Number (sequence, predict)</p> <p>Literacy: Identifying the sequence of activities for making the alarm could be extended into the task of writing instructions. The features of instructional texts are a focus of work of <i>The National Literacy Strategy: Framework for teaching</i> in year 4, term 1</p>
<p style="text-align: center;">∇ essential activities ∅ optional activities ⊕ assignment stages (all are essential)</p>			

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE (cont.)
FOCUSED PRACTICAL TASKS (FPTs)			
<ul style="list-style-type: none"> • that actions can be made to occur as a direct result of other actions • how different switches work • about possible output warning devices • how to use a control program 	<ul style="list-style-type: none"> ∇ Discuss with the children how 'feedback' is an essential part of a control system <i>eg the feeling of pain will cause someone to take their fingers away from a hot surface; a sensor above an automatic door senses a person's approach, causing the door to open.</i> ∇ Show the children how to make simple circuits with batteries and a wide variety of different types of switches, bulbs, buzzers or bells. ∅ Children could explore how different types of switches might be used <i>eg push-to-make to detect someone treading on something; push-to-break to detect someone lifting something; tilt to detect movement of something; and also switches to turn on and off.</i> ∅ Children will design and make switches of their own including a pressure switch. 	<ul style="list-style-type: none"> • use and understand the word 'feedback' • produce a range of working circuits using different kinds of switches • use a computer control program to control outputs <i>eg LEDs, bulbs, buzzers</i> 	<p>Content</p> <ul style="list-style-type: none"> • Use a range of examples <i>eg home burglar alarms, car alarms, microwave timers and alarm clocks.</i> • Tilt switches and reed switches used in conjunction with magnets may well be unfamiliar to the children, but will provide good solutions to this problem. • Circuits could be made using crocodile clips, twisted wire and/or insulating tape or could be joined with a connector strip, but are much more reliable if joints are soldered. <p>The movement of the valuable item could result in some audible (buzzer) or visual (lamp) feedback.</p> <p>Class management</p> <ul style="list-style-type: none"> • The IDEAs and FPTs could be incorporated into circuit work undertaken in science. • The children could work in small groups (three or four children) investigating <i>eg different switches</i>. They could make posters to illustrate their findings about how the switches work and could feed back their findings to each other. • Some children could use any of the switches they have encountered. Some children may find such choice daunting and would benefit from being given more direction. • Children could work in pairs to control their alarms.
<p style="text-align: center;">∇ essential activities ∅ optional activities ⊕ assignment stages (all are essential)</p>			

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE (cont.)
<p>DESIGN AND MAKE ASSIGNMENT (DMA)</p> <p>Design and make an alarm that will protect something</p>			
<ul style="list-style-type: none"> • how to generate ideas, considering the purposes for which they are designing • how to explore, develop and communicate aspects of their design by modelling their ideas in a variety of ways • how to consider reliability when developing proposals • how electrical circuits can be used to achieve functioning results • how to evaluate their products carrying out appropriate tests 	<ul style="list-style-type: none"> ⊕ Discuss with the children the task of making an alarm that will protect something <i>eg a valuable exhibit on display in the classroom</i>. For this type of task, children can bring in an item from home for display. ⊕ Ask the children to make prototypes of their ideas first, which they then develop into high-quality products. They should use labelled drawings to inform others about their ideas. ⊕ Ask the children to explain how they will make their alarm, and the sequence in which they will make it. They will need to consider the circuit and the type of switch they will use. Encourage the children to discuss the progress of their work and evaluate any changes they make with others. ⊕ Emphasise the quality of their design and, at the end of the assignment, the alarms can be tested <i>eg by the children trying to move each other's items from the display without the alarm going off</i>. 	<ul style="list-style-type: none"> • apply what they have learnt through IDEAs/FPTs in their designing and making • develop working prototypes of their design solution • produce a design sheet for the final product • discuss and finalise their design • create the alarm system • evaluate the effectiveness of their system 	<p>Health and safety</p> <p>When carrying out a risk assessment for this activity, teachers will need to consider the materials, tools and equipment being used.</p> <p>In addition, the following points should be noted:</p> <ul style="list-style-type: none"> • explain to children that they should not experiment with mains electricity and should use batteries in commercially available appliances only when supervised by an adult • do not use rechargeable batteries for this work – in the event of a short circuit they could get very hot and cause injury <p>Out-of-school activities and homework</p> <p>Children could gather information about alarm systems, circuits and switches using library books, CD-ROM and the Internet, if these are available.</p>
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