

Unit 6G Changing circuits (short unit)

ABOUT THE UNIT

This unit is designed to revise concepts to which children have been introduced in Year 2 and Year 4. The unit consolidates children's knowledge of materials which are electrical conductors, extends understanding of ways in which the brightness of bulbs or speed of motors in a circuit can be changed and develops children's understanding of the value of using conventional symbols for communication.

This unit provides opportunities for children to carry out a complete investigation relating to electric circuits.

Work in this unit also offers opportunities for relating knowledge and understanding of electricity to familiar phenomena.

This unit takes approximately 6 hours.

WHERE THE UNIT FITS IN

Builds on Units 2F 'Using electricity' and 4F 'Circuits and conductors'

Children need to:

- understand that a complete circuit is required for a device to work
- understand that switches can be used to control devices
- know that generally metals are good conductors of electricity and plastics are poor conductors.

Links with Units 3C, 4D and design and technology.

VOCABULARY

In this unit children will have opportunities to use:

- words and phrases relating to electrical circuits *eg complete circuit, conductor, insulator, circuit symbol, component, circuit diagram, cell*
- expressions for making and justifying predictions, generalising and summarising.

RESOURCES

- batteries of different voltages, wires, bulbs and/or buzzers for circuit construction
- electric motor
- circuit diagrams of 'real' systems *eg household appliances*
- diagrams of simple circuits
- fuse wires of different thickness and made from different materials

EXPECTATIONS

at the end of this unit

most children will:

suggest ways of changing the brightness of a bulb in a circuit; draw circuit diagrams and construct circuits from diagrams using conventional symbols; set up a circuit which can be used to investigate an idea and use knowledge about electrical conductors and insulators to answer questions about circuits

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

recognise conventional symbols for some electrical components and construct some working circuits with specified components

some children will have progressed further and will also:

interpret more complex circuit diagrams and describe the differences between wires usually used for circuits and fuse wires

LEARNING OBJECTIVES

CHILDREN SHOULD LEARN

- that the brightness of bulbs, or speed of motors, in a circuit can be changed
- that care needs to be taken when components in a circuit are changed to ensure bulbs/motors do not burn out

- that there are conventional symbols for components in circuits and these can be used to draw diagrams of circuits
- that circuit diagrams, using these symbols, can be understood by anyone who knows the symbols and can be used for constructing and interpreting circuits

- that the brightness of bulbs in a circuit can be changed by changing wires in a circuit
- to suggest a question to investigate, to decide what to do and what equipment to use to test this
- to make fair comparisons and draw conclusions

- to explain observations in terms of knowledge about electrical circuits

POSSIBLE TEACHING ACTIVITIES

- ◆ Show children some working circuits and review the factors which change the brightness of bulbs or speed of motors *eg by changing the voltage of the battery, adding extra batteries, components*. Demonstrate the effect of overloading a circuit and then ask children to construct circuits *eg one with two dim bulbs, one where the buzzer can be switched on and off*.

- ◆ Discuss communication using conventional symbols *eg in mathematics, road safety*. Ask children to draw a diagram of a circuit they made. Compare children's diagrams and the symbols they used for particular components and introduce the conventional symbols for battery, wires, switches and bulbs. Ask children to draw circuit diagrams using these symbols for others to construct, to draw diagrams of circuits set up by others and to decide and explain whether they will work or not. Present children with diagrams of circuits and ask them to identify conventional symbols used in these. Find and show children examples of circuit diagrams *eg from a washing machine or car manual* and discuss with them why these are useful.

- ◆ Tell children that someone has suggested that putting very thin wires into a circuit will alter the brightness of bulbs. Ask children to suggest a question to test *eg Does the thickness of the wire affect the brightness of the bulb? Does it make a difference what the wire is made of? Does the length of wire affect the brightness of the bulb?* Children may need to try out circuits to find out which has a suitable combination of bulbs and batteries and help them decide what evidence to collect *eg how to judge the brightness of the bulb*. Discuss their own results with children and ask them to make a generalisation. Ask children who investigated different questions to say what they found out. Talk about all the findings with the children.

- ◆ Ask children to think about some questions *eg*:
 - *Why does the length of wire used in this experiment make a difference to the brightness of the bulb when it doesn't usually do so?*
 - *Why was it safe to use bare wires in this work?*
 - *Why are wires usually covered with plastic?*
 Talk about children's answers with them and ask them to make up questions (with answers) about circuits and conductors for other children in the class. Use these questions and answers to review children's knowledge and understanding of electrical circuits.

LEARNING OUTCOMES

CHILDREN

- summarise ways in which the brightness of bulbs or speed of motors can be changed
- construct circuits that match the descriptions given

- construct a circuit from a conventional circuit diagram
- draw a circuit diagram of a working circuit
- examine an unfamiliar diagram of a simple circuit and explain how they know whether it will work when constructed

- try out circuits and decide what to do, making sure the comparison is fair
- state whether their prediction was correct and make a generalisation *eg the thinner the wire, the dimmer the bulb*


- identify that the wires used in the investigation are much thinner than the wires they use for connections
- explain it is safe to use bare wires in this work because they are using batteries with low voltage
- explain that wires are usually covered with plastic because plastic is an insulator

POINTS TO NOTE

This activity is intended to help children recall previous knowledge and understanding of how to make circuits. Teachers will need to take account of what it shows in their short-term planning for later activities in the unit. Children may need to be reminded that devices work only when there is a complete circuit.

Although the circuit symbol is for a 'cell' rather than a 'battery', at this stage, the term 'battery' can be used rather than the term 'cell'.

Children's learning will be enhanced by using a wider range of batteries, bulbs, bulb holders and switches than they used in Year 4.

 **SAFETY** – Remind children of the hazards of mains electricity. Batteries are safe because they are less powerful. Avoid using rechargeable batteries for circuit work as they can get very hot if short-circuited.

Thin fuse wire is needed for this investigation. Children will need to be reminded about matching components so that bulbs do not burn out.

This activity offers children the opportunity to carry out a whole investigation. It may be helpful to concentrate on the aspects of investigation highlighted in the learning objectives.



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