



Subject: DT

Year group: 4

Term: Spring

Unit name: Electrical Systems – Simple circuits and switches

Prior Knowledge -

- Children can design a structure using a cube or cuboid shaped shell and can explain the user and purpose.
- Children can draw an annotated sketch of a shell structure and can label it with materials and strengthening solutions.
- Children can make a prototype of a shell structure using paper to practise joining techniques and strengthening solutions (laminating, ribbing, corrugating)
- Children can select from PVA glue, glue sticks and scissors to cut and join materials (card and cardboard). They can use card or paper straws to strengthen their structure.
- Children can state if their structure is suitable for the intended user and purpose. They can offer a way to improve their structure.
- Children can strengthen a structure using ribbing, corrugating or laminating and explain what this means.

Assessment for learning

Recapping prior knowledge- beginning of unit- what do children already know?

Beginning of each lesson- focus on recall of previous learning (quick quizzes)

National curriculum:

- Use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups.
- To generate, develop, model and communicate their ideas through discussion, annotated sketches and cross-sectional.
- Select from and use a wider range of materials and components according to their functional properties and aesthetic qualities.
- Investigate and analyse a range of existing products.
- Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work.
- To understand and use electrical systems in their products.

Key Vocabulary series circuit, fault, connection, toggle switch, push-to-make switch, push-to-break switch, insulator, conductor, crocodile clip

Design Process

Investigative and Evaluative Activities (IEAs)

Focused Tasks (FTs)

Design, Make and Evaluate Assignment (DMEA)



Enriching lives every day; enabling our school community to learn, achieve and flourish through living 'life in all its fullness'



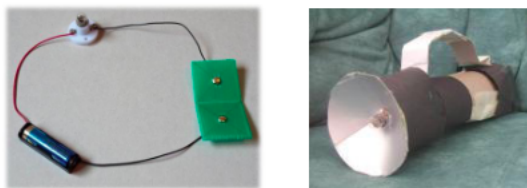
End points (what pupils MUST know and remember)

- Children can design an electrical circuit for a product. For example: a torch
- Children can draw an annotated sketch of an electrical circuit and can label it with materials and components.
- Children can select from batteries, switches, foil, paper clips, buzzers, bulbs to create their product.
- Children can name products that use electrical circuits – lights, torches, children's toys.
- Children can state if their electrical circuit and final product is suitable for the intended user and purpose. They can offer a way to improve their product.

Children can understand and use electrical systems in their products, such as series circuits incorporating switches, bulbs and buzzers.

Years 3/4 Electrical Systems
Simple circuits and switches

Instant CPD



Tips for teachers

- ✓ This project should be undertaken either around the same time or soon after electricity is covered in science.
- ✓ Use a selection of images of existing battery-powered products to add to the actual products that children investigate and evaluate.
- ✓ Check the condition of the batteries prior to activities.
- ✓ Stress the need for making secure connections.
- ✓ To reduce the number of requests for help, model the fault-finding process: check all the connections, ensure that bulbs are screwed in tightly and ensure that components are correctly connected.
- ✓ Have a 'working' circuit set up so that children can test suspect components.
- ✓ Some components (e.g. buzzers) need to be connected the right way round in a circuit, ensuring positive and negative match the poles of the battery.
- ✓ Make sure bulbs and batteries match e.g. 1.5v bulb with a 1.5v battery.
- ✓ Do not use rechargeable batteries.

Useful resources from www.data.org.uk

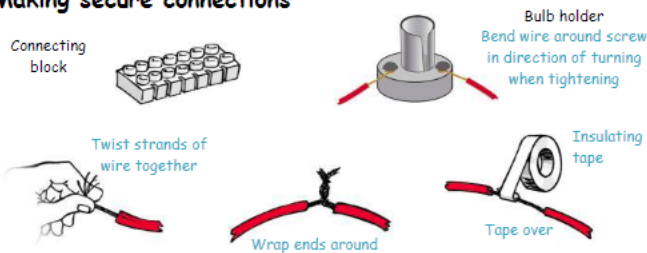
- Torches, Lamps and Lanterns
- Night Lights
- Developing Handmade Switches
- CPD Resources Primary Inset Guides

D&T Association publications:

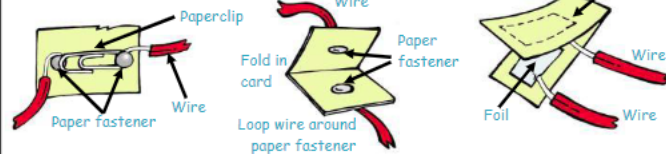
- Primary Helpsheets - Units 4C, 4D, 4E
- Primary Lesson Plans - Units 4C, 4D, 4E

Please note that these publications are based on previous National Curricula.

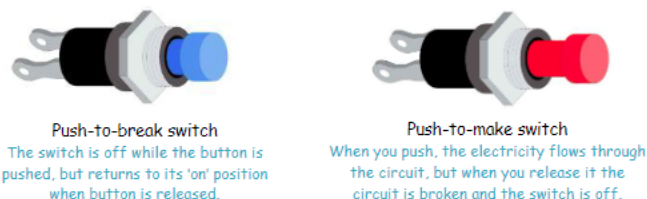
Making secure connections



Handmade switches

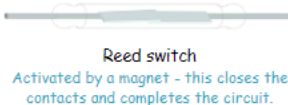


Commercial switches

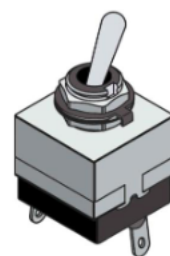


Push-to-break switch
The switch is off while the button is pushed, but returns to its 'on' position when button is released.

Push-to-make switch
When you push, the electricity flows through the circuit, but when you release it the circuit is broken and the switch is off.



Reed switch
Activated by a magnet - this closes the contacts and completes the circuit.



Toggle switch
Simple on/off switch

Standalone control box



When children are familiar with using electrical circuits they should be introduced to a simple standalone control box. The box will replace their switches and battery, and children can program their product to work automatically.

Designing, making and evaluating a night light for a brother, sister or friend

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
What sort of night light shall I make and who will it be for? What parts will it have? How will it appeal to the user?	Discussing ideas, drawing annotated sketches, cross-sectional and exploded diagrams, generating design criteria
What switch will work best for my night light?	Discussing ideas, modeling possible electrical circuits
How will I make the base, casing and shade?	Discussing, exploring and trialling materials
Who will I work with? How long will it take? What order will I work in?	Negotiating, developing and agreeing a plan of action
More thoughts... appraising, reflecting, refining	More actions... assembling, testing, modifying
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Will the night light meet the needs of the user and achieve its purpose?	Evaluating the nightlight with the intended user and against design criteria

Glossary

- Circuit** - path through which electricity passes.
- Conductor** - a material which allows an electric current to pass through it.
- Insulator** - a material which does not easily allow electric current to pass through it.
- Prototype** - a model made to test whether a design will work.
- Push-to-break switch** - a switch turned off by pressing it.
- Push-to-make switch** - a switch turned on by pressing it.
- Reed switch** - a switch operated by a magnet.
- Toggle switch** - a switch operated when a lever is pressed.
- System** - a set of related parts or components that together achieve a desired outcome.
- Output devices** - components that produce an outcome e.g. bulbs and buzzers.
- Input devices** - components that are used to control an electrical circuit e.g. switches.