

Our Intent is: To support our pupils in answering the question, "How do we design, make and evaluate solutions to real and relevant problems?" Using creativity and innovation, we inspire pupils to develop skills which impact on daily life.



Forton Primary School Design and Technology

Clougha Class
Summer 2
Year B

Key Concept: Electrical Systems

Focus: Simple programming and control

Key Question: What happens when I change the programme a little bit?

N.C. LINKS:

When designing and making, pupils should be taught to: **Design**

- 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
- generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design
- **Make**
- select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately
- select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities
- **Evaluate**
- 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
- understand how key events and individuals in design and technology have helped shape the world
- **Technical knowledge**
- apply their understanding of how to strengthen, stiffen and reinforce more complex structures
- understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages]

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	<ul style="list-style-type: none"> • understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors] • apply their understanding of computing to program, monitor and control their products
<p>Unit Overview: To programme commands to make the electrical circuit function.</p>	<p>Vocabulary:</p> <p>series circuit, fault, connection, toggle switch, push-to-make switch, push-to-break switch, battery, battery holder, light emitting diode (LED), bulb, bulb holder, USB cable, wire, insulator, conductor, crocodile clip</p> <p>control, program, system, input device, output device, process</p> <p>user, purpose, function, prototype, design criteria, innovative, appealing, design brief</p>
<p>Possible Outcome:</p> <p>illuminated sign noise-making toy vehicle</p> <p>nightlight display lighting</p>	
<p>Intended User:</p> <p>themselves younger children older children</p> <p>teenagers parents shoppers friends school</p> <p>general public</p>	
<p>. Building on Prior learning KS1:</p> <ul style="list-style-type: none"> • Experience of using construction kits to build walls, towers and frameworks. • Experience of using of basic tools e.g. scissors or hole punches with construction materials e.g. plastic, card. 	<p>Building on Prior learning when A follow B:</p> <ul style="list-style-type: none"> • Constructed a simple series electrical circuit, using bulbs, batteries, switches and buzzers. • Cut and joined a variety of construction materials, such as wood, card, plastic, reclaimed materials and glue.

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- Experience of different methods of joining card and paper.

Key Skills (Disciplinary)

Designing

- Gather information about users' needs and wants, and develop design criteria to inform the design of products that are fit for purpose.
- Generate, develop, model and communicate realistic ideas through discussion and, as appropriate, annotated sketches, cross-sectional and exploded diagrams.

Making

- Order the main stages of making.
- Select from and use tools and equipment to cut, shape, join and finish with some accuracy.
- Connect simple electrical components and a battery in a series circuit to achieve a functional outcome.
- Program a standalone control box, microcontroller or interface box to enhance the way the product works.

Evaluating

- Investigate and analyse a range of existing battery-powered products, including pre-programmed and programmable products.
- Evaluate their ideas and products against their own design criteria and identify the strengths and areas for improvement in their work.

Technical knowledge and understanding

- Understand and use computing to program and control products containing electrical systems, such as series circuits incorporating switches, bulbs and buzzers.
- Know and use technical vocabulary relevant to the project.

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Sequence of Lessons:

1. Investigative and Evaluative Activities

- Discuss, investigate and, where practical and safe, disassemble different examples of relevant battery-powered products, including some programmable and programmed commercially available products e.g. *Where and why the products are used? How do they work? What are the key features and components? How does the switch work? Is the product manually controlled or controlled by a computer? If it is controlled by a computer how does that improve the way the product works? What materials have been used and why? How is it suited to its intended user and purpose?*
- Ask children to investigate examples of switches, including those which are commercially available, which work in different ways e.g. push-to-make, push-to-break, toggle switch. Let the children use them in simple circuits e.g. *How might different types of switches be useful in different types of products? How might different output devices be used?*
- Remind children about the dangers of mains electricity.

2. Focused Tasks

- Recap with the children how to make manually controlled, simple series circuits with batteries and different types of switches, bulbs, motors and buzzers. Discuss which of the components in the circuit are input devices e.g. switches, and which are output devices e.g. bulbs, motors and buzzers.
- Demonstrate how to find a fault in a simple circuit and correct it, giving pupils opportunities to practise.
- Demonstrate and ask children to practise the use of a simple computer control program using an interface box, microcontroller or standalone control box to control output devices, e.g. bulbs and buzzers, using a repeating sequence of instructions.
- Ask the children to make a variety of switches by using simple classroom materials e.g. card, corrugated plastic, aluminium foil, paper fasteners and paper clips. Encourage children to make switches that operate in different ways e.g. when you press them, when you turn them, when you push them from side to side. Ask the children to test their switches in a simple series circuit.
- Teach children how to avoid making short circuits.

3. Design, Make and Evaluate Assignment

- Develop a design brief with the children within a context which is authentic and meaningful.

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- Discuss with children the purpose of the battery-powered, programmable products that they will be designing and making and how they will work more effectively for the intended user than those that are manually controlled. Consider who they will be for and how they address a problem or need.
- Ask the children to generate a range of ideas, encouraging realistic responses. Agree on design criteria that can be used to guide the development and evaluation of the children's products, including safety features.
- Using annotated sketches, cross-sectional and exploded diagrams, as appropriate, ask the children to develop, model and communicate their ideas.
- Ask the children to consider the main stages in making and testing before assembling high quality products, drawing on the knowledge, understanding and skills learnt through IEAs and FTs.
- Have the children write, test and debug programs that will control the electrical product they have made for a clearly defined purpose e.g. bulb on a nightlight switching off after a period of time when the user has gone to sleep or LEDs flashing on and off to illuminate a sign in a shop window.
- Evaluate throughout and the final products against the intended purpose and, where safe and practical, with the intended user, drawing on the design criteria previously agreed.

Enhancements:

N/A

End of Unit Outcome: An electrical circuit that is programmed to work.