

Curriculum Intent:

To use creativity and imagination to design and make products that solve real and relevant problems within a variety of contexts, considering their own and others' needs, wants and values and to be able to evaluate past and present design technology, its uses and effectiveness.



Subject	Term	Unit
DT	Spring	Electrical Systems
Prior knowledge Building on knowledge and skills	National Curriculum Focus	
<ol style="list-style-type: none"> 1. Constructed a simple series electrical circuit, using bulbs, batteries, switches and buzzers. 2. Cut and joined a variety of construction materials, such as wood, card, plastic, reclaimed materials and glue. 	<p>Understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors].</p> <p>Design</p> <ul style="list-style-type: none"> • 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 <p>Make</p> <ul style="list-style-type: none"> • 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

What?

- 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.

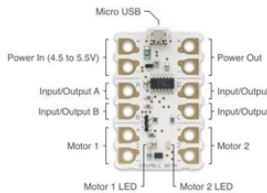
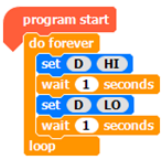
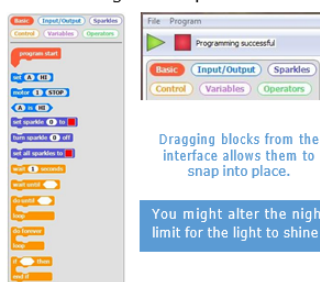

Why?

- Understand simple programming and control in Electrical Systems.

Key vocabulary

Program	– a sequence of instructions that can be used to control electrical components.	Light emitting diode (LED)	– an output device that glows when electricity is passed through it.
Microcontroller	– a device that can be programmed to control how an	System	– a set of related parts or components that together achieve a desired outcome.

	electrical product operates.		
Output devices	– components that produce an outcome e.g. bulbs, motors and buzzers.	Input devices	– components that are used to control an electrical circuit e.g. switches.
Process	– how a computer program controls one or more output devices.		

Key learning		
Objective	Learning	
Can I explore and evaluate electrical systems.	<ul style="list-style-type: none"> 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. <i>Where and</i> 	<p>Connecting up a Crumble and an example program This arrangement is for a nightlight or an illuminated sign that flashes on and off, using a light emitting diode (LED) as the output device.</p>   <p>A battery box (including three 1.5v AA zinc carbon batteries) connects to the Crumble's Power In pads. Switch the battery box off when not in use.</p> <p>A USB cable connects the Crumble to a computer.</p> <p>The +ve (red) lead is connected to the long leg of the LED and the -ve (black) lead to the short leg. The +ve lead connects to output A, B, C or D on the Crumble and the -ve lead connects to the -ve Power Out pad.</p> <p>Simple programming and control Crumble drag and drop interface and menus</p>  <p>Click the green arrow to start the program.</p> <p>Once the Crumble has been programmed, it will remember the program and run it automatically when the USB cable is disconnected.</p> <p>Dragging blocks from the interface allows them to snap into place.</p> <p>You might alter the nightlight program by including a time limit for the light to shine after it is turned on.</p> <p>Control boxes and program ideas</p> <p>An alternative to the Crumble or similar microcontrollers is a simple standalone control box or an interface box. Interface boxes sometimes use programming software in the form of flowcharts. Instructions and example programs can be easily found on the internet and adapted for use in products that children wish to design and make.</p> 

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-

	<p>make, push-to-break, toggle switch. Let the children use them in simple circuits e.g.</p> <p><i>How might different types of switches be useful in different types of products?</i></p> <p><i>How might different output devices be used?</i></p> <ul style="list-style-type: none">• Remind children about the dangers of mains electricity.	
<p>Can I explore the main stages of creating a circuit.</p>	<ul style="list-style-type: none">• 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	

	<p>e.g. switches, and which are output devices e.g. bulbs, motors and buzzers.</p> <ul style="list-style-type: none"> • 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. 	
<p>Can I design purposeful, functional,</p>	<ul style="list-style-type: none"> • Develop a design brief with the children within 	

<p>appealing products for themselves and other users based on a design criteria</p>	<p>a context which is authentic and meaningful.</p> <ul style="list-style-type: none"> • 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. 	
<p>To select from and use a range of equipment, and ingredients to make a product</p>	<ul style="list-style-type: none"> • 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.

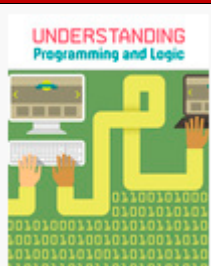
- Teach children how to avoid making short circuits.
- Have the children write, test and debug programs that will control the electrical product they have made for a clearly defined purpose e.g. bulb on a nightlight switching off after a period of time when the user has gone to sleep

	<p>or LEDs flashing on and off to illuminate a sign in a shop window.</p>	
<p>To evaluate their ideas and products against a design criteria</p>	<ul style="list-style-type: none"> 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. 	

Websites

- [Crumble kit suitable for KS2 and related guidance](#)
- [Primary Subject Leaders' File Sections 5.8 and 5.10](#)
- [Applying Computing in D&T at KS2 and KS3](#)
- [Torches, Lamps and Lanterns](#)
- [Developing Handmade Switches](#)
- [Night lights \(links to Literacy\)](#)
- [Handmade Switches Helpsheet](#)

Recommended Reads



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