Innovation

Sustainability

Subject: DT

Year group: 6

Term: Autumn

Unit name: Electrical systems- Monitoring and control (including programming)

National curriculum

- Design- generate, develop, model and communicate their ideas through discussion, annotated sketches, prototypes, exploded diagrams and computer-aided design
- Make- select from and use a wider range of materials and components
- Evaluate- understand how individuals in DT have helped shape the world
- Technical knowledge- 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.

Prior Knowledge –

- Initial experience of using computer control software and an interface box, a standalone box or microcontroller, e.g. Crumble.
- Some experience of writing and modifying a program to make a light turn on or flash on and off.
- Understanding of the essential characteristics of a series circuit and experience of creating a battery-powered, functional, electrical product.
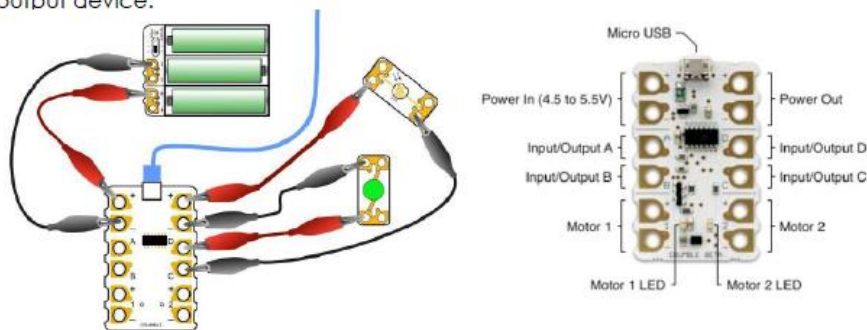
Key vocabulary

reed switch	purpose
toggle switch	Conductor
push-to-make switch	crocodile clip
push-to-break switch	control
light dependent resistor (LDR)	program
tilt switch	system
light emitting diode (LED)	input device
bulb	output device
bulb holder	series circuit
battery	parallel circuit
battery holder	function
USB cable	innovative
Wire	design specification
Insulator	design brief
user	

Design Process	Spiritual Development
Investigative and Evaluative Activities (IEAs)	2PE 1:12 Therefore, I will always be ready to remind you of these things, even though you already know them, and have been established in the truth which is present with you.
Focused Tasks (FTs)	
Design, Make and Evaluate Assignment (DMEA)	

Teaching aids

Connecting up a Crumble

This arrangement is for an automatic nightlight, using a light dependent resistor (LDR) as the monitoring or input device and a light emitting diode (LED) as the output device.

Power In (4.5 to 5.5V) — Power Out
Input/Output A — Input/Output D
Input/Output B — Input/Output C
Motor 1 — Motor 2
Motor 1 LED — Motor 2 LED

Example programs for an automatic nightlight

The LED connected to output D switches on when it goes dark. Change the value of the LDR connected to terminal C so that the system is activated at different light levels.
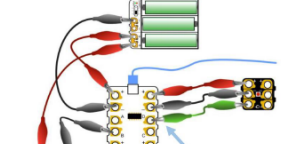
LED – connect +ve to D and -ve to Power Out

LDR – connect -ve to C and +ve to Power Out

An example program for an electronic toy moneybox

A sparkle LED is connected to the Crumble and changes from green to yellow to red every time a plastic coin is placed through the slot of the moneybox and depresses a micro switch connected to terminal B.

Connect the crocodile clips to 'common' and 'normally open' on the micro switch. Connect the +ve lead to a +ve terminal on the battery box and –ve lead to B.

Use the 'D' output for sparkles.

- How could children adapt the program so that it would detect a burglar stealing the moneybox?
- What type of output device could they use?
- What type of switch could detect the movement of the moneybox?
- How could the program be adapted to remind the user to save money on a regular basis?

Once the Crumble has been programmed, it will remember the program and run it automatically when the USB cable is disconnected.

Key Learning- what will the children know by the end of the unit?

- **Children develop an understanding of a range of products (e.g., nightlights, garden lights, alarm systems, security lighting, electronic moneyboxes) that respond to changes in the environment using a computer control program. They can identify input and output devices.**
- **Children gain an understanding of how components operate- light dependent resistors (LDRs) and a range of switches such as push-to-make, push-to-break, toggle, micro and reed switches. They use each of these components to control a bulb in a simple circuit.**
- **Children can talk about famous inventors related to the project e.g. Thomas Edison – light bulb.**
- **Through teacher demonstration and explanation, recap measuring, marking out, cutting and joining skills with construction materials that children will need to create their electrical products.**
- **Children draw on their related computing knowledge to write and modify computer control programs that include inputs, outputs and decision making. They test out the programs using electrical components connected to microcontrollers, interface boxes or standalone boxes.**