

Electrical systems – Torches



Year: 4
Term: Autumn

Essential Prior Knowledge

Children already know:

How an electrical circuit works, that electricity can come either through the mains, or from batteries and the names and functions of some main components (bulb, wire, battery, cell, switch from the science unit taught in Autumn 1.

The names of some electrical appliances and that insulators stop electricity and conductors allow electricity to pass through them.

How to generate and communicate ideas using sketching and modelling, using the views of others to improve their designs.

How to select appropriate materials and equipment for functional and aesthetic purposes.

How to evaluate how well their product works and if it matches their design.

Key knowledge (facts and skills) for unit

Technical and pre-design knowledge

Housing – children will know that this is the main body of the torch, which should be made from a sturdy material as it needs to hold the circuit inside.

Reflector - children will know that this is a reflective surface which lines the head of the torch, making the most of the light from the bulb.

LED – children will know that a **light-emitting diode** (LED) is a semiconductor device that produces light from electricity. LEDs last a long time and do not break easily (compared to incandescent lightbulbs). They can produce many different colours. They are efficient - most of the energy turns into light, not heat.

coin cell battery – children will know that coin batteries, also known as button batteries, are used to charge devices that have a longer shelf-life, like a watch or the key to your car. They're small, flat and round.

electrical not electronic – children will know not to confuse electrical with electronic: most toasters and torches are electrical, as they use the energy from electricity to create light or heat. Electronic devices, such as phones, have some decision-making capabilities, which require a processor

Design

- To know who my target audience is (primary school child) and explore how this will influence my research and design.
- To know how to conduct research to help me design my torch
- To know how to use product research, including target audience surveys, to influence my decision making.
- To know how to use research of existing torch models to create different possible torch designs.
- To know how to decide which design I would like to make by using my survey outcomes and represent this using sketches from different angles including the electrical circuit I will be using.
- To know how to change my design depending on what myself and others think.
- To know how to create a detailed set of instructions which explains how to make a functional torch.

Make

- To know how to construct a complete circuit using the correct components in a series circuit.
- To know how to use equipment to make precise measurements.
- To know which joins are needed the torch design model and to select the most appropriate method to secure their series circuit to their product.

Evaluate

- To know how to use a success criteria to evaluate my product.
- To decide if my design is functional and suitable for its purpose, considering my target audience.
- To say what was successful about my product.
- To say if there is anything I could improve on if I were to make a torch again.

Key Outcomes

Can I evaluate existing torches and make a switch?

Children will recall how to make a complete circuit from science and discuss switches or 'on buttons' and create them in the circuits in front of them. Children will recall insulators and conductors and make their own switch. They will explore and evaluate existing torches and create a set criteria for their design (e.g. create light, strong, stable etc) and decide on their target audience or 'client'.

Can I design an appealing and functional torch? *children will* consider recyclable materials or objects or materials that they think would be particularly well suited to achieve the design criteria (e.g. how the circuit will be kept safe within the housing to make sure it doesn't rattle about, which could cause wires to become loose (bubble wrap, elastic bands, tape, foam)). Children will use their knowledge of electrical conductors to think of objects that could be used to create a switch. Children will draw and annotate sketches from different angles to show design intention, including materials, colour and electrical circuits, whilst considering the target audience

Can I produce my electrical torch design?

Children will make a working circuit, including a switch. Then, they will create the housing for the torch, which should include the handle and the head (e.g. from a plastic bottle) and the circuit will be padded out so that the circuit fits inside or attach it to the inside of the handle using string or pipe cleaners.

Can I test my product against the success criteria?

Children will test and appraise whether their product is functional and fit for purpose against the set criteria.

How successful is my product?

Children will produce a full evaluation of their product including successes and improvements that could be made for the intended audience.

Assessing Pupils' Understanding and Progress

Pupils with secure understanding indicated by: Identifying electrical products and explaining why they are useful as well as helping to make a working switch. Identifying the features of a torch and how it work and describing what makes it successful. Creating suitable designs which fit the success and design criteria. Creating a functioning torch with a switch according to their design criteria.

Pupils working at greater depth indicated by: Identifying the features of electrical products, making a working switch and suggesting other ways this could be made, including mentioning conductors. Explaining what features are important to all torches and which are tailored to the target audience as well as generating suggestions for how the components could be made. Applying the outcome of the evaluation task to improve their design and adding special features specifically designed for their 'client'.

Key vocabulary

- Insulator
- Conductor
- LED
- Battery
- Coin cell batteries
- Wire
- Switch
- Housing
- Reflector
- Circuit
- Bulb
- Split pin
- Paper clip

