

**Year
3/4**

Electrical systems

Simple circuits and switches

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

siren for a toy vehicle reading light noise-making toy
nightlight illuminated sign torches table lamp
lighting for display hands-free head lamp
buzzer for school office other – specify

Homes	Travel and Holidays	Cities
Emergency Vehicles	School	Business
Enterprise	Light and Dark	other – specify

themselves	younger children	older children
teenagers	parents	grandparents
school	general public	other – specify

home	school	leisure	culture
enterprise	environment	sustainability	
local community	other – specify		

safety and security	hobbies and interests
utility	pleasure
energy saving	for sale
	other – specify

Design, make and evaluate a _____ (product) for _____ (user) for _____ (purpose)

To be completed by the teacher. Use the project title to set the scene for children's learning prior to activities in 10, 12 and 14.

buzzers, bulbs, bulb holders, zinc carbon or zinc chloride batteries, battery holders, wire, automatic wire strippers

suitable control program with interface box or standalone control box

right/left handed scissors, PVA glue, cutting mats

user, purpose, function,
prototype, design criteria,
innovative, appealing,
design brief

- Discuss, investigate and, where practical, disassemble different examples of relevant battery-powered products, including those which are commercially available e.g. *Where and why they are used? How does the product work? What are its key features and components? How does the switch work? Is the product manually controlled or controlled by a computer? 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?*
- Remind children about the dangers of mains electricity.

- Recap with the children how to make manually controlled, simple series circuits with batteries and different types of switches, bulbs and buzzers. Discuss which of the components in the circuit are input devices e.g. switches, and which are output devices e.g. bulbs and buzzers.
- Demonstrate how to find a fault in a simple circuit and correct it, giving pupils opportunities to practise.
- Use a simple computer control program with an interface box or standalone control box to physically control output devices e.g. bulbs and buzzers.
- 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.

- **Science** – know how to construct simple series circuits and have a basic understanding of conductors, insulators and open and closed switches.
- **Spoken language** – participate in discussion and evaluation of battery-powered products. Ask relevant questions to extend knowledge and understanding. Build their technical vocabulary.

- **Science** – know how to construct simple series circuits and have a basic understanding of conductors, insulators and open and closed switches.
- **Computing** – design, write and debug programs that accomplish specific goals, including controlling physical systems.
- **Spoken language** – asking questions to check understanding, develop technical vocabulary and build knowledge.

problem-solving	teamwork	negotiation
consumer awareness	organisation	motivation
persuasion	leadership	perseverance
other – specify		

Pupils should be taught to work safely, using tools, equipment, materials, components and techniques appropriate to the task. Risk assessments should be carried out prior to undertaking this project.

- Develop a design brief with the children within a context which is authentic and meaningful.
- Discuss with children the purpose of the battery-powered products that they will be designing and making and who they will be for. 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.
- Evaluate throughout and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

- **Spoken language** – maintain attention and participate actively in collaborative conversations, staying on topic and initiating and responding to comments. Develop understanding through speculating, hypothesising, imagining and exploring ideas.
- **Science** – know how to construct simple series circuits and have a basic understanding of conductors, insulators and open and closed switches.
- **Computing** – design, write and debug programs that accomplish specific goals, including controlling physical systems.
- **Art and design** – using and developing drawing skills.