



Electrical systems – Steady hand game



Year: 6
Term: Summer

Essential Prior Knowledge

Children already know:

- What electrical systems and what conductors and insulators are and
- How to conduct research to help inform designs
- How to use product research to influence their decision making.
- How to use research of existing torch models to create different possible electrical system designs.
- How to decide which design they would like to make by using my survey outcomes and represent this using sketches from different angles including the electrical circuit they will be using.
- How to change a design depending on what they and others think
- How to construct a complete circuit using the correct components in a series circuit.
- How to use equipment to make precise measurements.
- How to select the most appropriate method to secure a series circuit to their product.
- How to use a success criteria to evaluate a product and say whether it is suitable for its purpose, considering the target audience.
- How to say what is successful about a product and what could be improved.

Key knowledge (facts and skills) for unit

Technical and pre-design knowledge

Homopolar – children to know that a homopolar motor is a type of electromagnetic motor. These motors create a force (called Lorentz force) that is generated when electricity moves through a magnetic field. The copper wire is conducting electricity from one end of the battery to the other. As it moves through the magnets on the negative side of the battery, the force that causes the wire to spin.

Safety Warnings - Neodymium magnets are dangerous if swallowed and would need to be surgically removed. This is a project for older children who can understand the precautions and they should be supervised by an adult at all times. Check the batteries. If you notice a battery getting warm, stop, remove the wire and magnets and let it cool down. If a battery gets overheated, do not reuse it.

backboard – children to know it is a board placed at or forming the back of something, such as a piece of electronic equipment to make the design more appealing.

pliers – children to know it is a metal tool used for holding, twisting and cutting wire.

fit for purpose – children to know that when a product or service does what it is supposed to do, it is considered 'fit for purpose'.

'form follows function' – children to know that in 1856, an American skyscraper architect called Louis Henry Sullivan coined the phrase 'Form follows function', which designers still use today. In other words, all products should be designed with the function (The purpose of an object or how the product works) in mind first, then the design (To make, draw or write plans for something) (form) wrapped around it.

Design

- To know how to research existing electrical games and how they work to inform a design specification.
- To know how to create a 3D perspective design to meet the design specification and select a final design based on evaluation and feedback.
- To know how to design an innovative, functional, electrical system that is fit for purpose.
- To know how to draw an annotated plan for a homopolar motor system.
- To know how to develop and make changes where necessary to a clear plan for how I will make my homopolar motor electrical system.
- To know how to test my design ideas through creating a prototype.

Make

- To know how to apply my knowledge of electricity to create a complete circuit made from a range of electrical components
- To use nets to create the base blocks for the game design and decorate it according to the design criteria.
- To know how to construct a stable base for a game, accurately cutting, folding and assembling a net
- To know how to decorate the base of the game to a high quality finish
- To know how to use a range of tools accurately including pliers
- To know how to make and test a circuit incorporating a circuit into a base

Evaluate

- To know how to evaluate the steady hand game against the design specification, explaining its strengths and weaknesses, suggesting ideas for improvement
- To know how to decide whether the game is 'fit for purpose'

Key Outcomes

Can I research and identify design criteria?

Children will gather images and information about existing children's electrical toys and analyse a selection of them. Then they will research and identify the components of a steady hand game in order to create a design criteria for their own design and decide on how difficult they should make it depending on their intended audience.

How can I show my design intention?

Children will draw and annotate will create a 3D perspective drawing, side view and plan of their game design intention, including writing to explain choice of materials, and the design will show colour and electrical circuits, whilst considering the target audience and how difficult to make the shape of the game.

Can I create the base for my steady hand game design?

Children will use nets to create their bases and decorate them according to their design intention and criteria to make an appealing product.

Can I create the electrical system for my steady hand game?

Children will use their knowledge of electrical circuits to build a circuit with a buzzer, which closes when the handle makes contact with the wire frame. Children will make and test their circuits including buzzers or bulbs and incorporate them into the bases of their games. They will be able to explain the function of each component (buzzers make a noise/bulb makes light when the circuit is closed, batteries supply the electricity to the circuit, wire conducts electricity through the circuit).

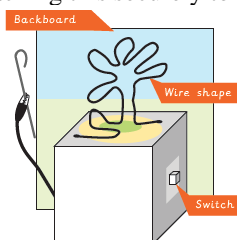
Can I test and evaluate the games?

Children will test their own and others finished games, identifying what went well and make suggestions for improvement.

Assessing Pupils' Understanding and Progress

Pupils with secure understanding indicated by: Creating a functioning homopolar motor. Identifying components in a steady hand game and designing one of their own according to their design criteria, using four different perspective drawings. Creating a secure base with neat edges that relates to their design. Making and testing a functioning circuit and assembling it within the case.

Pupils working at greater depth indicated by: Creating a homopolar motor which works reliably and explaining how it works. Designing a backboard for their game and designing a more complex shape as their base. Creating a high quality base with a good level of detail and adding a backboard which follows the same theme and references their original design. Creating a complex wire shape for their game and attaching this securely to their base.



Key vocabulary

- Backboard
- Battery
- Bulb
- Buzzer
- Circuit
- Conductor – a material that allows electricity to flow through it
- Copper
- Insulator - a material that does not allow electricity to flow through it
- LED – light emitting diode
- Magnetic field
- Pliers
- Series circuit – closed circuit where the current follows only one path
- Switch

