Electric Circuits - Year 6: Progression Map

National Curriculum Objectives

- associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
- use recognised symbols when representing a simple circuit in a diagram

Common misconceptions:

- Electricity is stored in appliances: Appliances convert electricity into other forms of energy (like light or heat), but they don't store electricity.
- Batteries Store Electricity: Batteries don't store electricity as electric charge. They store chemical energy, which is converted into electricity when used.
- Electricity is a modern discovery: Knowledge and experimentation with electricity date back to ancient times, with significant developments in the 18th and 19th centuries.
- Only Metals Conduct Electricity: While metals are common conductors, other materials like saltwater and human bodies can also conduct electricity.

Hinterland:

- General science concepts - Understanding basic physics concepts like forms of energy (light, heat, motion). Familiarity with the periodic table and properties of elements like metals. Awareness of concepts like chemical reactions and forces.
- Everyday experiences - Personal interactions with household electrical devices, batteries, switches, plugs/outlets. Observing appliances at home that utilize motors or make sounds. Seeing frayed cords, overloaded outlets, or results of electrical fires/storms.
- Historical context - Background on the history of scientific discovery and technological progress. Knowledge about key scientists and inventors relevant to electricity over time. Familiarity with the shift from older technologies like fire/gas lighting to modern electrically-powered lighting.
- Engineering concepts - An understanding of design principles, prototyping and improving designs over time. Knowledge of how engineers think about and solve problems.
- Safety knowledge - Risk assessment for electrical safety, understanding electrical hazards like overloaded outlets, the use of surge protectors, and the dangers of electricity in wet conditions

Future learning at KS3:

- **Year 1 Everyday Materials:** Understanding basic materials prepares children for later concepts in electricity, like conductors and insulators.
- **Y2 Uses of Everyday Materials:** Comparing materials based on their properties lays the groundwork for understanding why certain materials are used in electrical circuits.
- **Year 4 Electricity:** Basic circuit construction and understanding conductors and insulators directly prepare children for more complex electrical studies in Year 6 and beyond.

Lesson Titles:

1. How do electrical appliances work?
2. Why do batteries have voltage?
3. What are the parts of a circuit?
4. What are circuit diagrams?
5. How can we use electricity safely?
6. What is the history of electricity?

Scientific enquiry:

Lesson 1 - Identifying, classifying, and grouping.
Lesson 2 - Observing over time; comprative testing
Lesson 3 -Comprative testing or fair testing
Lesson 4 - Researching using Secondary Sources
Lesson 5 - Researching using Secondary Sources
Lesson 6 - Researching using Secondary Sources

Careers:

1. Electrical engineers design and improve electrical appliances and gadgets.
2. Electricians are heavily related to the practical installation, repair and inspection of electrical wiring, outlets and appliances.

Future learning at KS3:

- **Electrical Circuits (Advanced):** Deeper exploration of series and parallel circuits, and understanding more complex components.
- **Energy Transfers and Conservation:** Building on the concept of energy transformation in circuits to understand broader principles of energy conservation.
- **Electromagnetism:** Expanding on the basic knowledge of magnets and electricity to explore their interaction.

Coherence:

- **Maths:** Measurement: Understanding units of measurement related to electricity, such as volts.
- **Design and Technology:** Electrical Systems and Circuits in Products: Understanding and creating circuits in the context of product design and technology projects.
- **History:** Significant Inventions and Discoveries: Studying the history of electricity and its impact on society, including the work of key figures like Thomas Edison, Nikola Tesla, and Benjamin Franklin.
- **Geography: Optional -** Sustainable Energy: Exploring the role of electricity in the context of renewable energy sources and environmental impact.
- **Personal, Social, Health and Economic Education (PSHE):Safety Education:** Understanding the importance of electrical safety in everyday life.
- **Art:** Drawing and labelling circuit diagrams can support understanding and memory.

Big Ideas: (for teachers only)

1. All matter in the Universe is made of very small particles: (While the lessons on electricity may not delve deeply into atomic theory, the concept of electrical conductors and insulators hints at the atomic structure of materials, especially how electrons in atoms play a role in conducting electricity).

2. Objects can affect other objects at a distance: This idea is indirectly related to electricity through the concept of electromagnetic fields. While it might not be explicitly covered in primary school, understanding electric circuits lays the groundwork for later understanding magnetic and electric fields.

3. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event:
   - This fundamental concept of energy conservation is relevant in the study of electricity, as electrical energy is transferred and converted into other forms like light, heat, or motion.

Book Recommendations:

- "Science Comics: Electricity: Energy in Action" by Andy Hirsch
- "Oscar and the Bird: A Book about Electricity (Start with Science)" by Dianna Hutts Aston and Sylvia Long