Broadway Junior School

Subject: Science Topic: Electricity Year: 4 Term: Autumn 2

NC Purpose of Study
A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

Intent	Implementation	Impact
At Broadway Junior School we believe that a high quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational 'Big Ideas', pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. Science in our school is about developing children's ideas and ways of working that enable them to make sense of the world in which they live through investigation, as well as using and applying process skills. The staff here ensure that all children are exposed to high quality teaching and learning experiences, which allow children to explore their outdoor environment and locality, thus developing their scientific enquiry and investigative skills. They are immersed in scientific vocabulary, which aids children's knowledge and understanding not only of the topic they are studying, but of the world around them. We intend to provide all children regardless of ethnic origin, gender, class, aptitude or disability, with a broad and balanced science curriculum.	Teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all children are capable of achieving high standards in science. Our whole school approach to the teaching and learning of science involves the following: Science will be taught in planned and arranged blocks by the class teacher, to have a subject specific approach. This is a strategy to enable the achievement of a greater depth of knowledge. Through our planning, we involve problem solving opportunities that allow children to find out for themselves. Children are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom. Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge. Teachers use precise questioning in class to test conceptual knowledge and skills, and assess children regularly to identify those children with gaps in learning, so that all children keep up. Teachers build upon the learning and skill development of the previous years. As the children's knowledge and understanding increases, and they become more proficient in selecting, using scientific equipment, collating and interpreting results, they become increasingly confident in their growing ability to come to conclusions based on real evidence. Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the children's school career and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in-keeping with the topics.	The impact and measure of this is to ensure children not only acquire the appropriate age related knowledge linked to the science curriculum, but also skills which equip them to progress from their starting points, and within their everyday lives. All children will have: • A wider variety of skills linked to both scientific knowledge and understanding, and scientific enquiry/investigative skills • A richer vocabulary which will enable to articulate their understanding of taught concepts • High aspirations, which will see them through to further study, work and a successful adult life.

Key Vocabulary
Electricity, appliance, mains, battery, power, safety, Circuit, cell, battery, bulb, wire, switch, component, complete, incomplete, flow, energy, current, conductor, insulator, metal, material, test, switch, open, closed, control, circuit

Knowledge	Skills
Electricity is a form of energy that can be used to power appliances and devices. • Some appliances run on **mains electricity** (plugged into wall sockets), while others use **batteries** as a portable power source. • A **simple circuit** is made up of different **components** such as wires, bulbs, cells (batteries), buzzers, and switches. • Electricity flows through a **complete circuit** from the positive to the negative end of a cell. If there is a break in the circuit, electricity cannot flow and the components will not work. • A **switch** controls the flow of electricity by opening (breaking) or closing (completing) a circuit. • **Conductors** are materials that allow electricity to pass through them easily (usually metals). **Insulators** are materials that do not allow electricity to flow (usually plastics, rubber, wood). • Metals are good conductors; this is why electrical wires are metal on the inside but covered with plastic for safety. • It is important to use electricity safely — water and damaged wires can be dangerous. • Scientific diagrams can be used to show how circuits are made using **circuit symbols**.	Asking relevant questions and using different types of scientific enquiries to answer them. • Setting up simple practical enquiries, comparative and fair tests. • Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units. • Gathering, recording, classifying, and presenting data in a variety of ways to help in answering questions. • Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. • Reporting on findings from enquiries, including oral and written explanations, displays, or presentations of results and conclusions. • Using results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions. • Identifying differences, similarities, or changes related to simple scientific ideas and processes. • Using scientific vocabulary to explain how and why circuits work or fail

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Enrichment Opportunities
Link to PSHE – Safety in the home Link to DT - Torches

Learning Objectives/End Points
Pupils should be taught to: -identify common appliances that run on electricity -construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers -identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery -recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit -recognise some common conductors and insulators, and associate metals with being good conductors

Key Questions/Learning Objectives/End Points					
Lesson 1: Electrical appliances • Identify common appliances that run on electricity. • Distinguish between mains and battery power. • Recognise how to use electricity safely.	• **Lesson 2: Components in a Circuit** • Identify and name basic parts of a circuit (cell, bulb, wire, switch) • Understand that circuits need power to work.	• **Lesson 3: Will the Bulb Light? (Series Circuits** • Predict and test whether a bulb will light in a series circuit. • Understand that a complete circuit is needed for electricity to flow.	• **Lesson 4: Conductors and Insulators** • Recognise some common conductors and insulators. • Associate metals with being good conductors. Focussed Assessments\Y4plan_Elect_conductors_2020.docx	• **Lesson 5: Switches and Control** • Understand that a switch opens and closes a circuit. • Recognise the purpose of a switch in controlling electrical flow.	• **Lesson 6: Investigation / Applying Knowledge** • Use knowledge of circuits to design and build something functional • Apply understanding of conductors, insulators, switches, and circuits.
Starter: Whole-class brainstorm — what do we already know about electricity? **Main:** • Sorting activity using images or real items into *electrical* and *non-electrical*. • Further sort electrical appliances into *mains-powered* or *battery-powered*. • Take it further: Discuss how electricity is generated and how it reaches homes. **Safety Focus:** Look at electrical safety posters (UK Power Networks / Electrical Safety First). Create safety posters for display. **Plenary:** "Electricity detectives" – pupils walk around classroom noting items that use electricity.	**Starter:** Recap appliances – what makes them work? **Main:** • Introduce real circuit components and model how to connect a basic circuit. • Pupils build circuits in small groups to make a bulb light. • Label and draw what they made, identifying each component. • Use circuit symbols to model how scientists represent circuits. **Plenary:** Circuit challenge – can you explain what happens if one wire is disconnected?	**Starter:** Quick quiz – What do we need for a circuit to work? **Main:** • Provide pupils with sets of circuit components (bulb, wires, cell). • Pupils test different setups: open circuit, extra wires, missing battery, loose connections, etc. • Predict before testing: will the bulb light? • Record results and observations in a table. **Discussion:** Why didn't some bulbs light? What does "complete circuit" mean? **Plenary:** Pupils draw one working and one broken circuit, explaining the difference.	**Starter:** Review: what materials are used in wires? Why? **Main:** • Set up a simple circuit with a gap in one wire. • Provide a range of materials (foil, paperclip, plastic, rubber, coin, wood, ruler). • Pupils test each to see if the bulb lights, recording results in a table. • Discuss patterns – what types of materials conduct electricity? **Plenary:** Sort materials into "conductors" and "insulators". Discuss real-life examples (e.g. plug casing, cables).	**Starter:** Look at everyday switches (light switch, torch, toy). What do they do? **Main:** • Demonstrate a simple switch in a circuit (paperclip or foil contact). • Pupils design and build their own switch using simple materials (card, paperclip, split pins, foil). • Test their switches in circuits – can they turn the bulb on/off? • Discuss how switches keep us safe and how they are used in real life. **Plenary:** Pupils explain their design to a partner using scientific vocabulary.	**Option A – Design Challenge:** Create an **electric quiz board** or **steady-hand game** using circuits. **Option B – Fair Test:** Investigate "Which materials make the best switch?" or "How many bulbs can one cell light?" **Activity Steps:** • Plan: Draw a circuit diagram, list materials, make predictions. • Build: Construct and test design. • Evaluate: Record what worked well and what could improve. **Plenary:** Showcase projects and reflect on what has been learned about electricity.

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Careers

Linking Curriculum Learning to Careers

Discuss how the skills developed in this unit are used in a range of careers, including:

- Electrician
- Electronics Technician
- Power Network Engineer
- Power Systems Engineer
- Renewable Energy Engineer
- Wind Turbine Technician
- Solar Energy Technician
- Energy Scientist
- Energy Consultant
- Electrical Design Engineer
- Control Systems Engineer
- Automation Engineer
- Robotics Engineer
- Telecommunications Engineer
- Lighting Designer
- Lighting Technician
- Sound Engineer
- Computer Engineer
- Product Designer
- Train Electrical Engineer
- Aircraft Electrical Engineer
- Marine Electrical Engineer
- Smart Technology Engineer

Transferable skills such as Curiosity Observation Investigation Problem solving Teamwork Communication Research Organisation Attention to detail Classification Data handling Critical thinking Decision making Creativity Resilience Responsibility Confidence and Safety Awareness

Learning from Career and Labour Market Information

- Explore where electricity is generated and how it reaches homes, schools and businesses. Introduce pupils to the range of jobs involved in the electricity sector, including electrical engineers, electricians, power network engineers, renewable energy technicians, electrical technicians and energy scientists.

Addressing the Needs of Each Pupil

- Provide opportunities for every pupil to participate in practical electrical investigations regardless of prior experience or confidence.
- •Use differentiated equipment, visual instructions, vocabulary mats and structured roles to ensure inclusive participation.

Linking Curriculum Learning to Careers

Make direct links between scientific knowledge and real-world occupations.

Explain how understanding circuits, conductors, insulators, energy and safety is used by electricians and electrical engineers.

Link circuit construction and problem-solving to engineering and technical careers.

Encounters with Employers and Employees

- Ask visitors to demonstrate electrical equipment or explain how electricity is used safely in their workplace.
- Encourage pupils to prepare questions about the person's job, skills, qualifications and working day.

Experiences of Workplaces

- Explore photographs, videos and virtual tours of workplaces such as power stations, wind farms, electrical workshops, construction sites and engineering facilities.
- Compare different working environments linked to electricity.
- Discuss the equipment, clothing, safety procedures and teamwork required in different workplaces.