Mendell Primary School

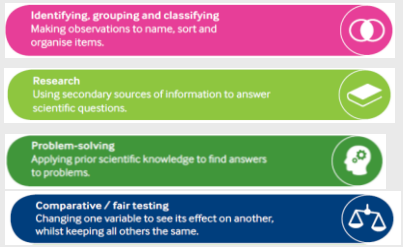
Aspire Challenge Achieve

Medium Term Plan Science

Year Group: 4	Term: Autumn	Teacher: Miss Jones	Subject lead: Sarah Bride

Overview: Electricity

- 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 End Points: By the end of this unit children will be able to:

- Talk about objects that use electricity
- Talk about how electricity is used to produce heat, warmth, movement and light and give examples.
- Make an electrical circuit and name the components
- Control a circuit using a switch
- Identify and classify conductors and insulators
- Research how electricity is produced in a variety of ways

Common Misconceptions:

Some children may think:
- electricity flows to bulbs, not through them
- electricity flows out of both ends of a battery
- Electricity works by simply coming out of one end of a battery into the component.

Unit key Vocabulary:

Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol

Links to other learning:

Design Technology.

Prior Learning:

To know that batteries should not go near your mouth. **(FS2)**
To know that plug sockets can be dangerous. **(FS2)**
To know that electric toys should not go near water unless specifically designed to. **(FS2)**

Future Learning:

- Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. (**Y6** - Electricity)
- 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. (**Y6** - Electricity)
- Use recognised symbols when representing a simple circuit in a diagram. (**Y6** - Electricity)

High Quality Text:

Oscar and the Bird; A Book about Electricity.

Scientist to study:

Benjamin Franklin, Michael Faraday, Lewis Howard Latimer and Mildred S Dresselhaus

Risk Assessment/Healthy and safety

Health and Safety. Ensure that at this early stage a discussion is held about the safety aspects of learning with electricity. Point out that they will not be using mains electricity.
The following video will help - http://www.bbc.co.uk/learningzone/clips/the-dangers-of-electricity/1646.html
When handling electrical components, children should be aware of breakable bulbs, bulbs that do not match the battery voltage and short circuits.

Teacher CPD:

Children in Year 4 do not need to use standard symbols for electrical components, as this is taught in Year 6

PLAN ASE Dougal Unit of work.

Reach Out CPD - https://www.reachoutcpd.com/ sign up for free.

	Learning Intention	Lesson Outline (Key Questions in colour)	Resources	Vocabulary	Lowest 20% Adaptations
1	L.I. I can identify and sort common	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is making observations and communicating results.**	Electricity concept map	**Electricity, electrical appliance/dev**	

<table>
<tr>
<td></td>
<td>appliances that run on electricity.</td>
<td>Discuss what prior knowledge the children have about electricity. – prior learning includes safety around electrical items, not putting batteries in mouths and keeping electrical items away from water. Pre Assessment: ask the children to recall what they already know in a mind map. add to this after lesson 6.

Children complete the electricity concept map (see resources) discussing ideas with their peers. Save these to return to in Lesson 6.

Word of the week – electricity – what is electricity? Electricity is the presence or flow of charged particles. What does it do? What examples of electricity do you know?

● https://www.bbc.co.uk/bitesize/topics/z2882hv/articles/zcwnv9q
Big question - What can electricity do?
Take children on an electricity hunt around the class and school. Ask the child to observe all the different affects that electricity has on the various appliances that they encounter– i.e. make them warm/cold, cause movement, produce light, and create sounds.

The following video shows the effects that electricity has - http://www.bbc.co.uk/learningzone/clips/the-use-of-electricity-no-narration/2407.html

Recording
Ask children to share ideas about how they could record their sorting of electrical appliances according to the affect that electricity has on them. They could have a chart like the one below, which they must add ticks to.

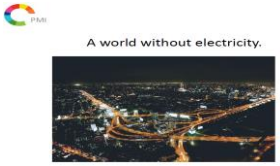
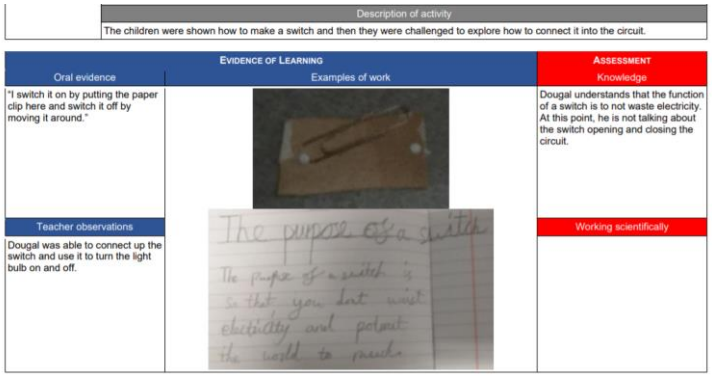
E.G:
<table><tr><th>Appliance</th><th>Changes heat</th><th>Changes sound</th><th>Changes light</th><th>Changes movement</th></tr><tr><td>Kettle</td><td></td><td></td><td></td><td></td></tr><tr><td>Television</td><td></td><td></td><td></td><td></td></tr><tr><td>DVD player</td><td></td><td></td><td></td><td></td></tr><tr><td>Computer</td><td></td><td></td><td></td><td></td></tr><tr><td>Remote-controlled toy car</td><td></td><td></td><td></td><td></td></tr></table>
In the same groups, children sort the appliances they identified into those that use mains, those that use batteries and those that use both using a Venn diagram. Discuss any that they find tricky or that they have allocated incorrectly. Photograph their sorted sticky notes or photographs of appliances.
CH: add examples of their own.</td>
<td>Sticky notes or pictures of appliances for sorting.</td>
<td>ice, mains, plug</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>L.I. I can research contributions to the field of electricity throughout history.</td>
<td>This is a Science lesson. In Science, we study nature and the behaviour of natural things.
Recap of prior learning:
Can you name an electric appliance that creates heat? sound? light??

Electricity throughout history –famous scientists.
Using the research cards allow the children time to explore their secondary source about a particular scientist and explore their contributions in science linked to electricity.

Each table will be given one of the following scientists to explore: Thales of Miletus, William Gilbert, Benjamin Franklin, Michael Faraday, Lewis Howard Latimer and Mildred S Dresselhaus – this resource provides a range of diversity.

Each group completes the research questions framework sheet (see resources) and gives a mini presentation to the class about their scientist and their contributions to electricity.</td>
<td>Scientist research cards.</td>
<td>Working scientifically, scientist.</td>
<td></td>
</tr>
</table>

		Further challenge can the children research a current scientist working in the field of electricity.			
3	L.I. I can identify the dangers associated with electricity in the home 	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is communicating.** **Recap of prior learning:** **Can you name a scientist who contributed to science linked to electricity?** **Can you name an appliance that runs on mains electricity? battery operated?** **Big question: Is electricity dangerous?** Explorify – zoom in zoom out – inside out - https://explorify.uk/en/activities/zoom-in-zoom-out/inside-out Explain that they will be discovering more about electrical safety by using an online resource. They will work in 2/3s, visiting every room in the virtual house, jotting down all the dangers that they discover (explain that some are repeated in different rooms). Allow them 15 minutes to complete the task. Once complete, take feedback from the class. **Which dangers did they see? Did any of them surprise them? Why is overloading a plug dangerous? Why should electricity not go near water?** Explain that they will be making electrical safety posters for the school, warning children of some of the dangers associated with electricity. Their poster will focus on one of the dangers they saw on the virtual house. They must think about where the poster would be displayed, for example on the door to the toilets, near a plug socket. Explain that they must choose the words of the poster carefully. Show them the example posters (session resource). Posters showing a potential hazard must get people's attention first, too many words might mean that people walk past without spending time reading on. Model designing a 'rough-draft' poster about overloading plug sockets on the board. Ask chn for their ideas for words or phrases, model choosing the layout. Will they have one large one (e.g. DANGER) at an angle, a clear picture, and then a smaller sentence to explain further? Which colours should they choose? Remind them to plan the size of the letters carefully (they don't want to start writing and then not be able to fit the whole word on the line). With a partner, children design and make an electrical safety poster. They choose one safety issue to focus on, e.g. not overloading plugs, not using anything with broken wires, never put anything in sockets, don't leave wires trailing across the floor, don't touch electrical things with wet hands, don't take electrical devices near water, don't have drinks near electrical devices.	Explorify – zoom in zoom out – inside out Class set of computers, card, pens, pencils, etc., example safety posters PowerPoint **Weblinks** Electro Mouse safety clip from www.bbc.co.uk Interactive game identifying electrical safety issues from www.switchedonkids.org.uk	**Electricity, danger, power, electrocute, plug, socket, safety**	
4	L.I. I can construct a simple circuit, identifying and naming its basic parts.  	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is asking questions and observing.** **Recap of prior learning:** – Explorify odd one out – electrical appliances. https://explorify.uk/en/activities/odd-one-out/electrical-appliances **Big question: How can we make a bulb light?** Place components including wires, bulbs, buzzers, switches and batteries/cells on each table. *Can you identify any of these components? Which ones have you seen or used before?* Take responses and check children know what each one does. **Constructing series circuits:** Give each small group of children the following components: 2 wires with attached crocodile clips, a cell, a bulb holder and a bulb. Challenge them to use all the components to light the bulb Ask the children to draw what they have made. Ensure that the components are labelled as children are not expected to use standard symbols at this stage it is useful to get them to label their work to ensure it is clear. Ask the children to look at their circuit – have they used the least amount of components they can? Allow time for groups to check. **T**he children can draw their circuit again if they have changed their circuit. Finally, provide the children with additional components such as buzzers, motors and ask them to incorporate these components in their circuits. Once again ask the children to draw their circuits.	Explorify odd one out – electrical appliances. Components for making circuits. Drawings/photos of circuits: some that will light bulbs and some that will not – will the bulb light?	**complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, open circuit, closed circuit.**	

		Which circuits will work? Can you repair the ones that do not work? Provide the children with drawings/photos of different circuits; some of which will allow the bulb to light, others that will not. Before constructing each of the circuits, the children must decide what they think will happen. The children draw how they repaired each of the circuits so that the bulb would light. (NB The 2014 curriculum states that the children should not use electrical symbols until Year 6). When handling electrical components, children should be aware of breakable bulbs, bulbs that don't match the battery voltage and short circuits.			
5	L.I. I can observe the use of switches and explain how they control the flow of electricity.	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is asking questions and observing.** Starter discussion: positive and minus – a world without electricity.  **Big question – How can we control the flow of electricity in a circuit?** – Think-pair-share – problem solving Introduce the use of a switch – **where can we see switches in real life?** Create a list of ideas in groups. Discuss **why are switches useful? How do they work?** Model to the children the use of a switch within a circuit – **what is happening?** Share : https://www.bbc.co.uk/bitesize/topics/zq99q6f/articles/zt8vg82 Provide children with switches. Ask them to connect it to their simple circuit they created in lesson 2. Does their switch successfully control the circuit? Encourage the children to try the switches in various places in their circuits. Ask the children how they think the switches work. Establish with them that a gap in the circuit needs to be filled so that the circuit is complete. Ask the children to draw their circuits and complete the following sentence stems: the purpose of a switch is … A switch controls …  **Exit Pass:** Provide children with an image of a circuit were the switch is open ask the children to explain why the bulb won't light.	Materials to make a switch, components for simple circuits.	**complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit,**	
6	l.I. I can sort materials into conductors and insulators.	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is setting up a test and communicating results.** **Recap of prior learning:** **What is a circuit?** **What components make a simple circuit?** **What is the role of a switch? How does it work?** **Word of the week** – conductor and insulator	A range of insulators and conductors e.g. tin foil, paper clips, string, lolly sticks, paper, clay, ruler, cork. Bulbs, crocodile clips, batteries.	**Conductor insulator.**	

Big question – Are all metals conductors? – Prediction – Answer - While **all metals can conduct electricity**, certain metals are more commonly used due to being highly conductive. The most common example is Copper. Another common misconception is the pure Gold is the best conductor of electricity.

Which materials are conductors/insulators?

Challenge the children to develop a means of testing a range of materials to find out whether they are conductors or insulators of electricity.

In groups, children construct a circuit which lights up a bulb.

Demonstrate how to place a spoon into the circuit using an extra wire. Give each group a selection of spoons of different materials and sizes to test. Groups test for spoons that insulate and conduct electricity. Children should make a group record of their results to share with the other groups in the class.

Groups compare their results. *What did you discover?* Encourage children to make general conclusions relating to the material each spoon is made out of, e.g. all of the metal spoons conducted electricity therefore metal conducts electricity.

Children collect small objects made from a variety of different materials. They predict and then test which objects will conduct electricity.

Children must choose a way of recording that will clearly show an audience which materials are insulators and which are conductors. Children record their predictions and findings in a simple table or chart and write a conclusion explaining what they have discovered.

Once the children have classified a range of materials, allow them a chance to look closely at components again; this time explaining why they are made from particular materials.

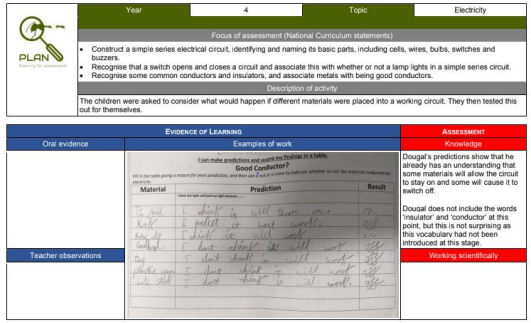
Finally, they can be challenged to make their own switch using materials that will conduct electricity.

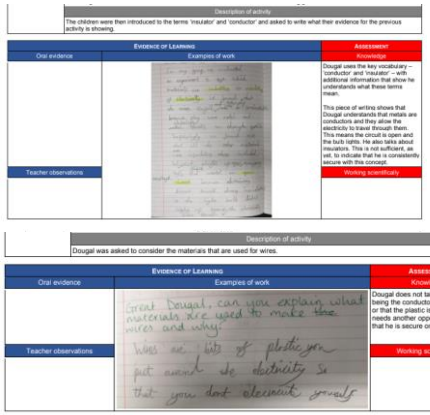
Encourage the children to draw their designs; explaining how they think they will work.

CH: can the children get their circuit to light without any wires?

The following video might help children to understand circuits, conductors and insulators - https://www.bbc.co.uk/bitesize/topics/z2882hv/articles/zxv482p

Exit pass: Explorify what if...? what if everything conducted electricity. https://explorify.uk/en/activities/what-if/everything-conducted-electricity





Post assessment: add to mind map from lesson 1.