EYFS to KS2 Physics Progression Model (Electricity)

This progression map is intended to supplement your scheme or the national curriculum. You can use it to emphasise the key learning you want at each key stage.

Electricity used to be very well taught in primary school when the KS2 SATs included science. Pupils were able to make complete circuits and troubleshoot. In my experience this is now less common. So I have included troubleshooting in my progression model.

I have also included static electricity, not least because of the magic of forces at a distance.

I find the rope model for electric circuits at KS2 does the job of helping pupils 'see' what is going on inside the wires - making the invisible, visible and the intangible, tangible. I have included key ideas to point out and ask questions about.

Finally, for EYFS and KS1 I assert that water play helps pupils learn about electrical current later on. I have no evidence to back this up, other than my own visceral understanding of electric current. I can almost feel the current flow around a circuit, like water along a channel - splitting and recombining at a junction. Give your pupils the opportunity to experience this.

	Physical Sensations to Experience and Discuss	Misconceptions	Problem solving and investigation	Thinking Questions
EYFS/ KS1	Static Electricity: rubbing balloons an jumpers and hair. Making balloons stick to walls. The forces will be too small to feel, but you can feel hair standing up. Pick up small pieces of paper using a charged ruler, comb or balloon.		Which materials can you "charge up"? (note - charge is a useful word for static electricity).	Does it matter how hard you rub? Will the balloon stay on the wall longer? Will the ruler pick up more pieces of paper? Does it matter what material you rub it on?

	Flow: we use the idea of electricity flowing like a stream of water in KS2/3 - let your children experience and discuss how water flows through tubes, gutters, round corners etc. Let them get their hands wet. Hopefully they will be able to apply this physical hinterland to air their understanding of current in later years.			
KS2	The rope model (here). Things to point out: • The rope is the charge. • electrical current is like the moving water in a river - it is the **flow** of charge. • the rope (charge) is already there in the wire - the cell doesn't provide it. • the rope doesn't get used up as it goes round - charge doesn't get used up. • the current is the same all the way around the circuit - it doesn't speed up or slow down	Many pupils believe that charge (or current) gets used up by components like bulbs - it doesn't. The word 'charge' is problematic in everyday English - we say we are charging a mobile phone when we mean we are storing more energy in the battery. This is different to 'charge' in physics, which means to put electrical charge onto an insulator.	9 times out of 10, circuits don't work the first time. Practical work with circuits can be a frustrating and demotivating experience. A useful skill to explicitly teach is finding and fixing problems with electrical circuits. Teach pupils to: • Check the cell still has enough energy. • Check the bulb works. • Check the wires work. A good way of doing this is to have a couple of working example circuits around the room. Pupils can come and try out their component they suspect isn't working and replace it if necessary. Make sure suspect components are put into	Why do all the bulbs light up the moment you switch on the circuit? Why doesn't the electricity take time to reach the bulbs? (Answer - the rope model shows that the moment the cell starts moving the charge in the wires (the rope) the whole loop moves at once. Why are materials which are good at charging up all insulators? (answer: when you put charge onto an insulator (e.g. balloon) the charge stays put. If you put charge onto a conductor (e.g. a metal ruler) the charge can flow elsewhere. So, when you charge an insulator, the charge stays there).

	anywhere. • It is a model - charge isn't really a solid string - but it helps us explain what is happening. (It's like a simile). What happens when: • You add more components to the model (A: the rope is harder to move - it slows down - current is reduced). • You add more cells (A: the charges move faster - you get more current).		'component hospital' and not put back in the main supply. Once you have working circuits, you can add multiple bulbs to see what happens and categorise materials into conductors and insulators (note - the materials you can charge up by rubbing on hair/wool are insulators.	