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| **Session 3: Designs, ideas and circuit diagrams** | | | |
| Science curriculum area: **Electricity** | | i. 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  ii. use recognised symbols when representing a simple circuit in a diagram | |
| Working Scientifically (**UKS2**) | | i. recording data and results of increasing complexity using scientific diagrams and labels  ii. identifying scientific evidence that has been used to support or refute ideas or arguments | |
| Teaching Objectives | | * Identify from circuit diagrams those circuits that will or won’t work * Draw an accurate circuit diagram * Research and explain why electrical components behave as they do in terms of resistance | |
| Other Curriculum areas | | **D&T:** Evaluate ideas and products against design criteria and consider the views of others to improve their work; understand and use electrical systems in their products | |
| Teaching Objectives | | * Feed back on others’ designs * Use feedback to improve their own design * Understand how electrical components in their design work to the desired effect | |
| Key Vocabulary: electricity, electrical circuit, circuit diagram, circuit symbol, components, cell, battery, positive/negative, terminal, connect/connection, loose connection, short circuit, wire, crocodile clip, bulb, bright/dim, switch, buzzer, volume, motor, fast(er)/slow(er), conductor, insulator, metal/non metal, voltage, current, resistance | | | |
| Resources  Circuit challenge, circuit symbols, feedback forms | | | Weblinks  Please see You Will Need card on our website for weblinks. |
| Whole Class: *Print off all resources.* To start this session explain that the chn have been set a circuits challenge by the Dragons to complete in their teams – but they only have 3 mins to complete the challenge – in that time they also need to ‘repair’ the non-working circuits! Come back together and discuss the circuits challenge. Explain that the Dragons were impressed by the ideas boards and annotated diagrams, but want to know that the chn really understand the workings of circuits and can represent their design through technical circuit diagrams. Chn will need to ensure that the circuit diagram of their design is accurate so that any manufacturer could interpret them. Explain that the Dragons not only want them to create an accurate diagram of their circuit but also want an explanation of how each component works and how resistance plays a key role in the design (although not required by the NC resistance is a useful term for KS2 chn to encounter… plus the Dragons want to ‘understand’ the circuit diagrams fully!). The Dragons have therefore asked chn to annotate their circuit diagrams, explaining how each component works. Do the chn know how a bulb works? Show them the BBC clip about Circuits and explain that tungsten in the bulb adds ‘resistance’ to the flow of the electric current as well as being long (coiled) and thin – this is what causes it to glow. Then send chn off to create their circuit diagram with ‘resistance’ annotations. They also need to explain whether their bulbs, buzzers and motors will be highly powered, or of a more subtle power (for effect), and how this can be interpreted from the diagrams (voltage of batteries and components). Once chn have done this, come back together and lay all current designs out around the classroom for chn to look at one another’s. Get chn (and yourself as chief dragon) to feed back (see forms) on the designs in terms of the use of electric components for the effects to be created. Chn should especially be looking to identify any innovative uses of conductors, switches and motors as well as raising questions about design features that may be unclear. Each gp can then take their feedback and revise their design. | | | |
| Activities: **Circuit diagrams** - give chn the circuit diagram symbols and challenge them to create a circuit diagram as a ‘blue print’ for their design. Remind chn to refer back to success criteria. Chn to complete online research to establish scientific explanations for resistance within the components they are using and to annotate their circuit diagram, adding in this information (remind chn that this is a secondary source of information). Get each gp to include their summary explanation of the impact of their power levels on the various components in the circuit and the voltages of components. **Finalisation of design** - get chn to finalise their design ideas by discussing their feedback and implementing any changes. They may also have new ideas to add, having evaluated other designs. | | | |
| Plenary | Can chn now note how useful high resistance can be in their circuit? Run back through how each component works and get chn to give themselves a grading of how they felt they did in their understanding and explanation of this. Check all chn have a clear understanding at this stage. How useful did the chn find the feedback? Talk about how useful it can be to get someone else to look at a design or idea as they may be able to reflect on it with fresh ideas. | | |
| Outcomes | Children will   * Draw a circuit diagram with a summary of the brightness, volume and speed of components within it * Annotate their circuit diagram with explanations of the role of resistance in making components work * Feed back on other’s designs * Use feedback to improve their design | | |