**Electrical conductors
Lesson 1: Selection & conductivity investigation**

**Introduction**

In the first ‘unplugged’ lesson of the unit, pupils use their knowledge of electricity to construct circuits and identify the output. They are introduced to the term selection and use this to explain what happens to the output when conductors and insulators are added to the circuit.

**Time:** @60 minutes

**Learning objectives**

* To identify the output in an electrical circuit
* To understand the term selection
* To use selection when describing the output of an electrical circuit

**Materials needed:** a range of components to create circuits (batteries, wires - crocodile clips, lamps, buzzers, motors, battery holders), sheets of paper to record drawings of circuits on, printouts of ‘materials recording’ sheet, a range of materials for testing electrical conductivity (paper, card, kitchen foil, scissors, graphite pencils, coins, felt, pencil sharpeners, rubbers, etc.), lesson presentation

**Lesson summary**

1. Introduction: Identifying outputs (10 minutes)
2. Creating and representing circuits (15 minutes)
3. Introducing selection (10 minutes)
4. Testing electrical conductivity (15 minutes)
5. Reviewing learning (10 minutes)

**Introduction: Identifying outputs (10 minutes)**

* Before the session starts, place a range of electrical components for pupils on their tables (see materials needed).
* Recap the names of the components and invite ideas on how they could be grouped (**slide 3**).
* Establish that some of the components can be classified as ‘having outputs’ because they produce something when electricity passes through them, and that this output stops once the electricity is removed from the circuit.
* Identify the output of each of the electrical components pupils have been given: e.g. the bulb gives out light; the buzzer makes a noise; the motor spins around.
* Use **slide 4** to define the concept of outputs and invite pupils to identify other examples they commonly use (tablets, TV screens, game consoles, etc.).

**Creating and representing circuits (15 minutes)**

* Use **slide 5** to explain to pupils that they are going to use the electrical components to create several circuits, each with an output, and then record these circuits in the form of a simple drawing (not using circuit diagrams) where they label the output.
* Review pupils’ understanding of the term abstraction and identify how it could be used to create simple images that represents the components (batteries, bulbs, wires, etc.).
* Give pupils time to work in small groups to build electrical circuits and use a simple drawing to record it and label the output. Examples of how circuits could be recorded are included on **slide 14**.

**Introducing selection (10 minutes)**

* Display **slides 6-8** in turn and ask pupils to read and respond to each slide based on whether or not they meet the condition. Pupils should carry out the first action if they meet the condition and the second action if they don’t.
* Display **slide 9** and invite pupils to share what the term selection means. Highlight that they have just made use of selection when deciding which action to carry out in the previous activity.
* Use **slide 10** to introduce the concept, an action is only carried out when a certain condition is/isn’t met. Using the images on **slides 10 and 11** to show pupils everyday examples of selection. Invite pupils to offer suggestions on what condition needs to be met and what will happen if the condition is/isn’t met?

**Testing electrical conductivity (15 minutes)**

* Explain to pupils that they are going to modify their circuits to allow them to test the materials provided to see if they allow electricity to flow through them. Invite suggestions on what the term electrical conductors means if pupils have previously used this (**slide 12**).
* Allow pupils to share their initial ideas on how the materials can be tested, before giving out copies of the materials recording sheet and asking them to test and record the materials provided to see if they are electrical conductors (**slide 13**).

**Reviewing learning (10 minutes)**

* Invite pupils to share their findings by identifying which materials were electrical conductors and which were not.
* Use **slide 14** to link this idea to selection and establish that the condition that needs to be met is the electrical output (bulb lights, buzzer makes a sound) and if this condition is met the material is an electrical conductor and if it isn’t then it isn’t. Review the learning objectives on slide 15 if you wish.

**Extension ideas**

You could go on a class ‘selection-walk’ around the school and in the local area. Pupils could identify and record systems where they think selection is being used examples traffic lights, pelican crossings, zebra crossings, automated doors, atms, etc.

**Differentiation**

**Support:** Pupils may benefit from being supported by an adult or their peers when constructing their circuits and identifying outputs.

**Stretch & challenge:** Pupils could design a recording table and use the terms conductors and insulators when describing materials. They could also identify patterns in the materials that are conductors and insulators. E.g. conductors are made from metals; insulators are made from non-metallic materials; graphite is a non-metallic conductor...

**Opportunities for assessment**

* Informal assessment of pupils’ understanding of outputs and selection from class and group discussions.
* More formal assessment if wished of their circuit drawings and recording sheets.