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| **2. Components  LESSON PLAN**  **—** | | | | |
| **PROJECT ACTIVITY**  **1.** Please [click here to view the EEF Teaching and Learning Toolkit strand on Feedback](https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit/feedback/) and to read the ‘What should I consider’ section at the bottom.  **2.** Please follow this [Link](https://docs.google.com/forms/d/e/1FAIpQLSeBIjaxISpZVH89IfwYGHYPXLVJhBeTSt8616yFIcME1U6gng/viewform?pli=1) to answer the questions below.  **a.** (Multiple choice) To what extent do you think the feedback policy in your school tallies with the evidence-based recommendations in paragraph 1 of ‘What should I consider?’ (i.e. the paragraph beginning ‘Providing effective feedback…’)?  **b.** (Optional) Please share any examples/ideas for giving feedback in physics lessons in ways that align with these recommendations.  Please note:   * These ideas do not have to be for Yr7/8 electric circuits * You can find more information on feedback specific to science in recommendation 7 of the [EEF Improving Secondary Science Guidance Report](https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_improving_secondary_science.pdf#page=38)). | | | | |
| **LESSON SUMMARY**  In this session we will introduce abstract representations of components and circuits. By the end of the lesson students will know the symbols of 4 important components, | | | and should understand how a circuit diagram relates to and differs from a real circuit, while appreciating why it is useful as a means of representation. | |
| **OBJECTIVES** | | **1.** Know the names, symbols and functions of some important components  **2.** Interpret and draw circuit diagrams | | |
| **EQUIPMENT LIST** | | **•**  Mini-whiteboards  **•**  PRACTICAL TASK: Each group to receive 1 cell, 2 bulbs, a switch and 4 wires. Ideally students will work in pairs, but groups could be up to 4 students. | | |
| **RESOURCES** | | **•**  PowerPoint presentation  **•**  Worksheets | | |
| **DIFFERENTIATION/**  **ADAPTATIONS** | | **•**  Show additional components, especially voltmeter & ammeter  **•**  Practical activity can be done virtually using PhET | | |
| **TIMETABLE & DESCRIPTION OF ACTIVITIES** | | | | | | |
| TIME  ACTIVITY  RESOURCES | | DESCRIPTION | | | RESEARCH | |
| 00:00 – 00:10  Starter  PowerPoint | | **Slide 6:**  Interleaved questions – see slide for questions and answers | | | 4c. Memory: Provide opportunities for pupils to retrieve knowledge they previously learnt [Link](https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_improving_secondary_science.pdf#page=26) | |
| 00:10 – 00:25  Components  PowerPoint  Worksheet | | **Slide 9**: Demonstrate pictures and examples of different components. This should include physical examples of your school’s particular circuit components.  Ensure you point out the two ends of a battery in real life and in the circuit diagram.  While demonstrating a switch, ask “How does this work? (A: by breaking a complete loop so that current cannot flow around it)”  **Task 1**: Students fill table of some important components (battery, wire, bulb, switch).  AfL: Use mini-whiteboards to check understanding. | | | 4a. Memory: Pay attention to cognitive load – structure tasks to limit the amount of new information pupils need to process - Plan lesson sequences so that any necessary background knowledge, such as the significance of battery terminals, is covered in advance. The number of components introduced here is also kept to a minimum to avoid cognitive overload. Additional components (resistor, ammeter, voltmeter) will be introduced later. [Link](https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_improving_secondary_science.pdf#page=25)  6a. Language of Science: Carefully select the vocabulary to teach and focus on the most tricky words.  Note for students with EAL: in many languages you ‘open’ the light – this is contrary to opening a switch to break a circuit. Make sure students can see the visual aspect of having a switch open or closed to avoid confusion. [Link](https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_improving_secondary_science.pdf#page=33)  Possible misconceptions around the role of a battery:  Misconceptions research on IOP Spark: Most pupils see the battery as the source of electrical effects in a circuit. [Link](https://spark.iop.org/most-pupils-see-battery-source-electrical-effects-circuit)  Misconceptions research on IOP Spark: Many students think that electric current or electric charge (or ‘electricity’), rather than energy, is stored in a battery. [Link](https://spark.iop.org/many-students-think-electric-current-or-electric-charge-or-electricity-rather-energy-stored-battery)  7a. Feedback: Find out what your pupils understand - It is important that you build up an accurate picture of the current understanding of all your pupils [Link](https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_improving_secondary_science.pdf#page=38)  4c. Memory: Provide opportunities for pupils to retrieve knowledge they previously learnt [Link](https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_improving_secondary_science.pdf#page=26) | |
| 00:25 – 00:55  Circuit diagrams  PowerPoint  Worksheet  Practical equipment:   * 1 cell * 4 wires * 2 bulbs * 1 switch   per group | | **Slide 15**: Show photos of real circuits to explain why circuit diagrams are useful  **Slide 16**: Explain the differences between a drawing and a circuit diagram.  Demonstrate how to convert a real circuit to a circuit diagram on whiteboard, students to copy.  **Task 2:** Convert a drawing to a circuit diagram, then interpret circuit diagrams  **Practical:** Build circuit diagrams on Task 2 using equipment. Practise retrieving and putting away electrical equipment – this will help with later, more complex practical tasks. | | | 1b. Preconceptions: Develop pupils’ thinking through cognitive conflict and discussion – By showing a complicated circuit, students appreciate that a verbal description of a circuit rapidly becomes unwieldy; hence the need for circuit diagrams is established. [Link](https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_improving_secondary_science.pdf#page=12)  3c. Modelling: Explicitly teach pupils about models and encourage pupils to critique them – A circuit diagram is a model of a circuit which captures its essential features in an abstract way – it is not the same as the circuit. [Link](https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_improving_secondary_science.pdf#page=21)  5b. Practical work: Sequence practical activities with other learning - You need to plan how their practical skills develop in the same way as you plan the development of their knowledge. [Link](https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_improving_secondary_science.pdf#page=29) | |
| 00:55 – 01:00  Plenary  PowerPoint | | **Slide 24:** Once they have packed away, students look at incorrectly drawn circuit diagram, offer critiques and draw an improved version on mini-whiteboards.  AfL: check mini-whiteboards. | | | EEF Teaching and Learning Toolkit, Feedback strand: When giving feedback, compare what a learner is doing right now with what they have done wrong before. [Link](https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit/feedback/) | |