

## What's a battery?

### What's the science?

Batteries are often taken for granted, yet many people don't fully understand what they are or how they work. Batteries are not a source of electricity but are a store of chemical energy that is transferred into electrical energy – a process called electrochemistry. The demand for batteries that are more powerful, longer lasting and less damaging to the environment is becoming ever more pressing. Even rechargeable batteries have a limited lifespan.

### What are scientists doing about it?

Often electricity from solar panels and wind turbines is not produced at times when demand is highest. Scientists continue to research how to store this electricity in efficient batteries until it is required. Rechargeable batteries, in cars and mobiles, are often lithium-ion but 'rechargeable' does not equal 'ever-lasting' so scientists are developing batteries with prolonged lifespans. They are researching materials for batteries as alternatives to lithium that are even more versatile.

### How could you explore this in the classroom?

- ▶ Discuss with learners where the electricity comes from to power an appliance. Ask them to name as many electrical devices as possible and then differentiate between those powered from the mains (plugged in) or elsewhere (a battery or solar energy). Link to numeracy by asking them to display this in a Venn diagram.
- ▶ To observe how a battery supplies energy in a fun way, use a 'Circuit Ball' or 'Energy Stick' (available from retailers like school suppliers, eg TTS, Amazon, or eBay) to create 'human circuits'. When the metal strips on the ball or stick are both touched, current is passed through sweat on fingers to complete the circuit. The battery is found inside the ball/stick.
- ▶ Ensure learners know it is unsafe to dismantle a battery. Instead, to consider how a battery stores energy, use a commercially available lemon or potato clock kit to build your own, or watch a video. Batteries depend upon the chemistry going on inside. Compare the brightness of lights powered by lemons and conventional batteries. This may be by observation (real life or videos) or measurement if a voltmeter is available.

#### Curriculum links

Electricity; numeracy (representing data); literacy (writing instructions); DT; observing and measuring

## Batteries 'driving' our lives?

### What's the science?

Pollutants from petrol and diesel cars are a major contributor to global warming. Battery-powered cars are often presented in the media as a panacea for this problem. However, there are issues with the production and disposal of batteries in terms of environmental impact. The materials used in their manufacture can be rare and their extraction may have a negative environmental impact.

### What are scientists doing about it?

Scientists are constantly seeking to improve the efficiency and lifespan of batteries – not only for use in transport, but in other technologies too. Scientists are researching alternatives to traditional battery components as a way of potentially addressing environmental problems. Other scientists are aiming to extend the life of rechargeable batteries so that they need to be replaced less often.

### How could you explore this in the classroom?

- ▶ Discuss the need to end reliance on vehicles powered by fossil fuels. Do the learners appreciate why this is important? What alternatives are there? They may suggest fully electric cars, hybrids, hydrogen cars or using a bike. Are they aware that the electricity for cars may be produced at fossil-fuelled power plants?
- ▶ A 'team' of learners could create a presentation about the positives and negatives of using batteries or fossil fuels to power vehicles. The rest of the class could then cast votes on which they think is the sustainable fuel for the future.
- ▶ Electric and hybrid cars depend on efficient batteries. Learners can make a simple motor to exemplify how batteries can transfer energy needed for movement.
- ▶ Investigate with the learners the difference that is made by using batteries of different voltages. Ask them to predict what will happen.
- ▶ Learners can use a world map to identify the major battery-material producing countries. They can colour code according to the material extracted. Have them investigate the carbon impact of transporting raw materials to the place of manufacture.

#### Curriculum links

Electricity; observing; introducing motors; predicting; geography; literacy (discursive writing)

**Sources** [Lithium](#) | [FOE Europe](#) [Developing countries pay environmental cost of electric car batteries](#) | [UNCTAD](#) [Demand for raw materials for electric car batteries set to rise further](#) | [UNCTAD](#) [The Faraday Institution](#) | [The Faraday Institution](#) | [STEM outreach](#)