



# The Light Bulb Moment

## Teachers' notes

Key Stage 1 (5–7 year olds)

Lecture 1 of 3: Sparks Will Fly: CHRISTMAS LECTURES 2014

A revolution is happening. Across the world people are taking control of the devices we use every day, customising them, creating new things and using the sparks of their imagination to change the world. What if we can find new uses for visible light, beyond simply as a means to see in the dark? Can we explore the greater range of uses if light bulbs could be lighter, smaller, coloured and long lasting?

### Context

Incandescent traditional bulbs similar to that invented by the Geordie inventor Joseph Swan have been in use for well over 150 years. They have been the most prominent electrical lighting choice for all that time, producing their trademark yellow glow for generation after generation. In recent years, however, there has been significant development in the usefulness of light emitting diodes or LEDs. The benefits of this change have led to a far increasing range of uses, and flexibility of control switches such that lights are no longer solely used to provide visible light to see in the dark!

### Children will be able to work scientifically by:

Identifying and Classifying:

- Making comparisons between simple features of objects
- Using their own observations and ideas to make suggestions

Children will learn:

- Light bulbs have a number of uses including warning, sensing and monitoring.
- Many lights remain on even when the room is in darkness
- Some switches are operated by humans but some work without direct human contact

Cross curricular opportunities:

- Learning outside the classroom (STEM learning trail)

### Resources suggested

A wide variety of light bulbs, including LEDs, battery operated and mains operated and light bulb boxes. Christmas lights are a great resource for this activity and usually offer good variety.

Sunglasses with the lens removed - cheap toy glasses are fine. These simply assist role play to improve observation skills.

## Lesson Outline – summary

### Starting the lesson



“**Explore:** Pupils observe, compare and contrast the features of different light bulbs. Light bulbs can be sorted into groups according to similarities and differences. There are many obvious variables such as size, shape, colour, battery or mains. However there are scientific details to draw attention to also. *What if we look inside the bulb? What if we want to make a bulb change colour? Take Care but note Which bulbs are hottest when switched on?* Introduce the new term LED as a type of light bulb.

### Main activity



“**Learning Walk:** Pupils take on the role of a light detective. Role play through the wearing of a pair of special light finding glasses create the investigators atmosphere. Identify a range of lights in settings out of the classroom. Examples, computer screens, fire exit, door bells, car lights, street lights, phone screen.

“**Application of new learning:** Show on the large screen an image of a light-scape. Pupils spot lights and think about why they are used. Note the difference between light reflections and light sources.

“**Extension activity** . To think about how lights are switched on and off.

### Plenary



“**Reflection:** A simple game to challenge pupils to apply the learning about LED and traditional light bulbs to new contexts. Ideally in a hall or playground (large space), one side is labelled LED and the other is labelled traditional. The teacher reads out a statement of a scenario and pupils run to either the LED or traditional bulb so as to represent their choice.

## Lesson outline - detail

**Slide 1:** Check that pupils recognize and use the term light bulb. Have available a number of light bulbs for pupils to handle/observe. Encourage comparative language biggest to smallest, brightest to dimmest, hottest to coolest, coloured and not coloured. Encourage pupils to raise questions and wonder! Example *Why are bulbs different? Where does the light come from? Where are they used? What do they do? What if?* **Extension:** Use coloured cellophane to make the white light glow a different colour and then look at the coloured lights to compare. LED lights have a solid colour whereas traditional lights need to be coated. The filament cannot change colour.

Use the video <http://bit.ly/xmasP1> : Prof George shows how the traditional light bulbs work, with a dramatic demonstration!

**Slide 2:** Pupils put on detective glasses to start the role play that they are now light detectives who will search for evidence. Ideally pupils to go out of their own classroom or even out of school to visit a setting that allows exploration and identification, eg the school kitchen, the school office, the school car park, local fairground, local surgery, local dentist, local supermarket - anywhere! This is a deliberate and planned activity to find light used other than in lighting! Examples include: computer screens, warning lights, sensors, head lights, mobile phones, fire exit signs.

**Slide 3** A picture of a new light scene provides an assessment opportunity. Q&A session to include: *Which lights are not coming from bulbs?* (the moon, the reflections in the water) Find lights for warning people; lights for decoration; lights for safety; lights to help you see in the dark etc.

**Slide 4** The inside of a car at night - a light scene probably familiar to most pupils. This can be a similar activity to slide 3 but extension opportunities to ask about how lights are switched on and off. The headlights normally need a human to flick the switch whereas the seat belt warning light goes off when the seatbelt is clicked and comes on when someone sits on the seat. It is enough to raise these examples as amazing clever switches and to make pupils think more closely about how things work? Detailed electronic answers are not needed.

**Slide 5:** A prompt to the activity although the slide is not needed to complete the activity. Use a large space with two labels either side of the floor area. You will need labels for the two bulb types . Traditional light bulbs and LED. Teacher reads out a statement from the sheet at the end of these notes and pupils run to the best bulb for the job.

**Homelink:** A chat challenge: Ask parents to sit in the dark in the kitchen with you and to spot the lights that still have jobs to do.

## Websites

Clip link: <http://bit.ly/xmasP1>

The CHRISTMAS LECTURES can be found at: <http://bit.ly/1E5Zpm1>

## Teacher Science Background knowledge

**Incandescent Lights:** These bulbs have changed little since their invention. An incandescent bulb is comprised of a metal fitting which plugs into an electrical source. The metal fitting is called the filament and is surrounded by either a vacuum or an inert gas. When electricity passes through the filament it begins to glow giving off heat and light. The more electricity which is passed into the bulb, the brighter the light produced.

**LEDs:** LED stands for Light Emitting Diode. Unlike incandescent bulbs, LEDs are made up of a material called a semiconductor. When an electrical current is passed through this solid material it releases energy in the form of light only. LED lights have the following advantages.

- No wasted heat: This means there is a reduced risk of accidental burns. This is of concern not just in warmer climates, but also in a public venue such as a bar or theatre.
- Solid: A solid material, makes for greater durability. LEDs do not smash so easily
- Savings: LEDs last much longer. A standard incandescent bulb will last for a maximum of 1500 hours while an LED can last for up to 60,000!
- Energy: Most LEDs consume only a fraction of the electricity that an incandescent bulb does.
- Colour: In order to change the colour of an incandescent bulb it has to be coated in a special, non-combustible paint. This is not exactly pleasing to the eye. LEDs come in a variety of colours making them more adaptable, that's why they can be used for almost any lighting situation.

A great and easy activity is the making of a simple working light that can be thrown to stick on an iron or steel surface. Throwies are made from an LED bulb, a coin battery, a magnet and a bit of tape, a real must for science clubs. See <http://bit.ly/1JFQbNE>

A great range of books to accompany the CHRISTMAS LECTURES, consider for your library corner. <http://bit.ly/18ts5sc>

For more primary science lessons with a topical theme see also <http://bit.ly/1zazXHw>

## MAKING CHOICES: A RUNNER GAME

### Traditional Light bulbs v LED bulbs

Which would you choose? (... why?)

Examples

|   |   |
|---|---|
| To light up a dog collar                          | <b>Answer:</b><br><b>LED</b><br><br><b>Why?</b><br>Lightweight  |
| To flick on and off with music at a disco         | <b>Answer:</b><br><b>LED</b><br><br><b>Why?</b><br>stay cool  |
| To fit into a lamp at home                        | <b>Answer:</b><br><b>Traditional</b><br><br><b>Why?</b><br>Most existing fittings take these bulbs, and they are often easier to fit              |
| Car headlights                                    | <b>Answer:</b><br><b>Previously traditional bulbs but are increasingly LEDs in clusters</b><br><br><b>Why?</b><br>to give brightness              |
| The school hall                                   | <b>Answer:</b><br><b>Probably traditional but LEDs would be better</b><br><br><b>Why?</b><br>money saving . the school has these fittings already |
| To use to show the middle of the road (catsqeyes) | <b>Answer:</b><br><b>trick question- no light bulbs - reflection only</b>   |