

KS2 Lesson Plan



Campaign to Protect
Rural England
Standing up for your countryside



Lesson Title—Seeing Stars

Lesson time: 60 mins

Key stage: KS2

Curriculum area: Science

This is a lesson plan developed by The Campaign to Protect Rural England (CPRE) with funding from the Royal Astronomical Society. CPRE is one of England's oldest environmental charities that works locally and nationally to protect, shape and enhance a beautiful, thriving countryside for everyone to value and enjoy. We have long been a leading voice in the campaign against light pollution. We have a special interest in this issue: darkness at night is what makes rural areas distinctive. But light doesn't respect boundaries; it can spread for miles from the source blurring town and country. Light pollution wastes energy and money; has negative effects on wildlife and more recently has sparked major concerns about the harmful effects it can have on people, not only by disrupting their sleep but the human ability to naturally produce hormones.

We have created the most detailed maps ever of Britain's night skies, using satellite data captured at 1:30am throughout September 2015. The maps are split into nine colour bands, which show the range of light levels around the country and where the darkest skies can be found. These maps can be found at this website: nightblight.cpre.org.uk

CPRE's traditional audience is usually adult but it wants to engage younger audiences with some of the key environmental issues that will face the next generation. This lesson plan is a fun and educational way for students to learn about space and environment. The lesson is particularly relevant for children living in London and other towns and cities who may have a very poor view of the night sky and may not have had the opportunity to see a dark starry night sky due to light pollution.

Learning objectives:

- Describe different types of light pollution
- To recognise some sources of light pollution and describe how these affect how we see stars in the night sky
- To conduct an experiment to find out how artificial light can be directed and which materials and shapes would help do this

Success criteria:

- Children are able to describe what light pollution is and how it affects how we see the night sky
- Children can name at least one type of light pollution and describe possible sources
- Children can describe their experiment findings and which shapes and materials would be likely to prevent light pollution caused by street lamps

You will need:

Black paper, torches or light sources (circuits with bulbs); Lego figures (or blocks); interactive light pollution map; paper (various colours including tinfoil and shiny paper); scissors, paper clips; tape

Introduction:

Ask pupils to close their eyes and imagine that they are some of the first humans on earth. Ask them to imagine stepping out of their cave at night and gazing around them. What can

they see? They might be able to make out shapes of trees, mountains and rocks and if they look up they'll be able to see the night sky full of stars. Ask them to imagine what those stars look like. Can they see different colours, different shapes and constellations (a group of stars creating a shape, some

named after animals or mythological figures)? Visit: <https://www.google.com/sky/> to look at and talk about stars, constellations and galaxies. Some children will be able to name types of stars such as dwarf or giant stars. Encourage those children to share what they know with the class.

Now ask them to fast forward to the 21st century and imagine they're in the middle of a big city at night time. What can they see? Perhaps they can see illuminated famous landmarks, rows of street lighting, brightly lit bars, shops and restaurants, car headlights.

Ask the children to open their eyes and talk about the differences they imagined. Why can't we see as many stars nowadays? Have they ever been somewhere where the night sky was really clear? Where was that? What were the weather conditions like? What could they see? Ask two or three pupils to share their experiences.

Explain the concept of light pollution: the night sky is flooded with artificial light sources which brighten the sky and prevent us seeing the stars so clearly. Explain the three types of light pollution:

- Skyglow – the glow over a town or city created by lots of lights
- Glare – the uncomfortable brightness of a light source
- Light trespass – lights that encroach from someone else's property

Show the children this interactive map:

nightblight.cpre.org.uk/maps/ and find the location of your school. How much light pollution is there in your local area? Are there any nearby areas where it is worse or better? Why might that be? Light pollution not only prevents us from seeing the starry night it also means we don't sleep very well and it affects animals and birds. Additional questions (which may be used for individual or pair follow up):

- Find somewhere in England which has a lot of light pollution
- Find somewhere in England that looks really dark

- Find the level of light pollution in the town where you live
- Find the light pollution levels near your house. What are they? Match it to the colour chart and find the number

Development:

The good news is that some local councils are starting to put in street lighting that lights up streets but doesn't leak light pollution into the sky. Your task is to design a street lighting system that will light up an area where it's needed but produce little upward light.

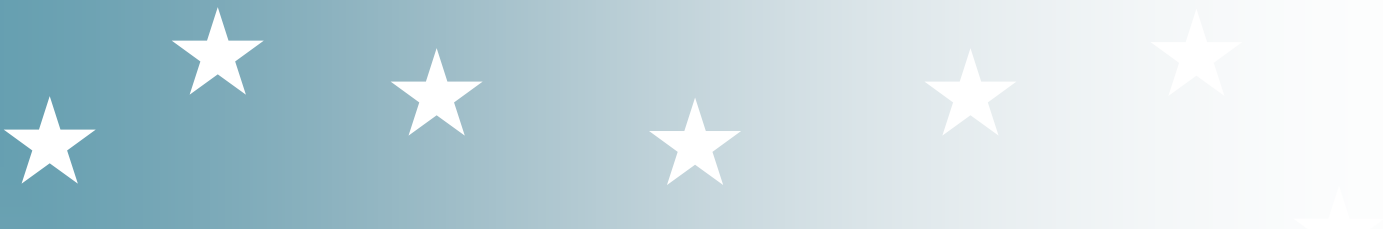
In pairs, ask pupils to talk about the problem and discuss possible solutions. Give each pair a torch or small light source (perhaps circuits with bulbs that they have previously created) and a piece of black paper. Remind them that it is not safe to look at the light directly. Ensure the classroom is dimly lit (perhaps with blinds down or lights off) but light enough to see their work. Ask pupils to experiment with the angle of light, creating paper shields or guards for their light sources that illuminate the dark paper below and provide enough light for a small Lego figure (or a block) to be seen. They can experiment with different colours and shapes and use tape or paper clips to fix the shields to the light sources. Is a light coloured paper better for creating a shield? Could it be reflective? What shapes work best?

Ask the pupils to record their findings by taking photographs or creating short videos that can be uploaded onto the school's website or learning environment. Don't forget to recycle the used paper after the lesson.

Plenary:

Share the findings with the class and discuss what worked and what didn't. Try to come to some general conclusions about the shape or colour of the light shields. What does this tell us about light and how light travels?

Recap on the learning objectives and ask pupils to share three things they have learnt today in talk partners. Can they describe the three types of light pollution?



Extension/variation:

Do a survey of the local area and note down all visible light sources. Can pupils see street lighting, security lights, local landmarks with lighting? What does the local area look like at night?

Encourage pupils to explore the interactive map and look at major cities, rural areas and areas where friends or family live. Can they talk about why some areas are darker/lighter than others?

Ask pupils to write a letter to the local council arguing the case for street lighting that doesn't add to light pollution. Alternatively, they could write to a local business that leaves its lights on at night and ask them to create a more sky-friendly lighting system. Remember to address their concerns (costs, security), as well as the benefits. More information is available on the Night Blight website.

Take part in a star count – locate a constellation that should be visible in the UK at the time of year you are leading the activity (use <http://astronomynow.com/uk-sky-chart/> for help). Count the number of stars you can see of that constellation. If you're having trouble identifying it, try using a phone app to view the sky or looking up images on the internet.

- Try to do your count on a night when the sky is clear, with no haze or clouds. It is recommended that observations are made after 7pm in winter but will need to be later in summer so the sky is sufficiently dark. If it's too late for children they could ask their parents or other adults to do it for them.
- People should make a count of the number of stars seen with the naked eye (not with telescopes or binoculars) and make a note for class.

Get in touch

CPRE would love to hear about these lessons and see examples of the students work. Please send letters, star count results, photos etc. to the details below.



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