MAYOR OF LONDON

THE LONDON CURRICULUM

KEY STAGE 2

ILLUMINATING LONDON

THE LONDON CURRICULUM

PLACING LONDON AT THE HEART OF LEARNING

The capital is the home of innovations, events, institutions and great works that have extended the scope of every subject on the school curriculum. London lends itself to learning unlike anywhere else in the world. The London Curriculum aims to bring the national curriculum to life inspired by the city, its people, places and heritage.

To find out about the full range of free resources and events available to London schools please go to:

www.london.gov.uk/london-curriculum.

I have someone I'd like you to meet…
This is Fen the Fox from Fenchurch Street.
He likes to creep about the city,
To inspect and explore the buildings so pretty.
Join him on his journeys to discover
The secret world of London uncovered.
Look out for him along your way,
He might have something interesting to say!

HOW TO USE THIS PACK

This pack is designed to be flexible, to give you control over what you teach and when. The resources in this learning pack all sit within the Illuminating London theme and promote cross-curricular teaching.

This learning pack includes activity plans which address learning objectives across the following subject areas:

- **Art & Design** (Topic: Lighting up London)
- **Science** (Topics: The Sun and our Solar System; Light and Growing)
- **History; English** (Topic: The Stars of Victorian Theatre)
- **Religious Education; English** (Topic: Light in Religious Festivals)

This learning pack is designed so that you can pick and choose between the topics; you're free to teach whichever topics you'd like and in whichever order you'd like. Each activity plan displays an approximate duration time and highlights specific KS2 learning objectives relating to the activities described.

The activity plans relating to specific topics often follow on from each other, so we'd recommend that you teach these in succession. However, you may choose to teach different topics in whichever order you wish, for example, you might want to teach Spotlight on Victorian Theatre before Lighting up London.

The topic-based activity plans follow a similar structure to the lesson plans produced in our Key Stage 3 resources. There are three distinct phases of learning:

- **Discover**
  (Presenting and analysing background information relating to the given topic)

- **Explore**
  (Contextualise learning from the Discover activities by exploring the concepts in action through a London-based visit)

- **Connect**
  (Task-based activities which connect the background information analysed in the Discover activities with the contextual understandings gained on the visit in the Explore activities)

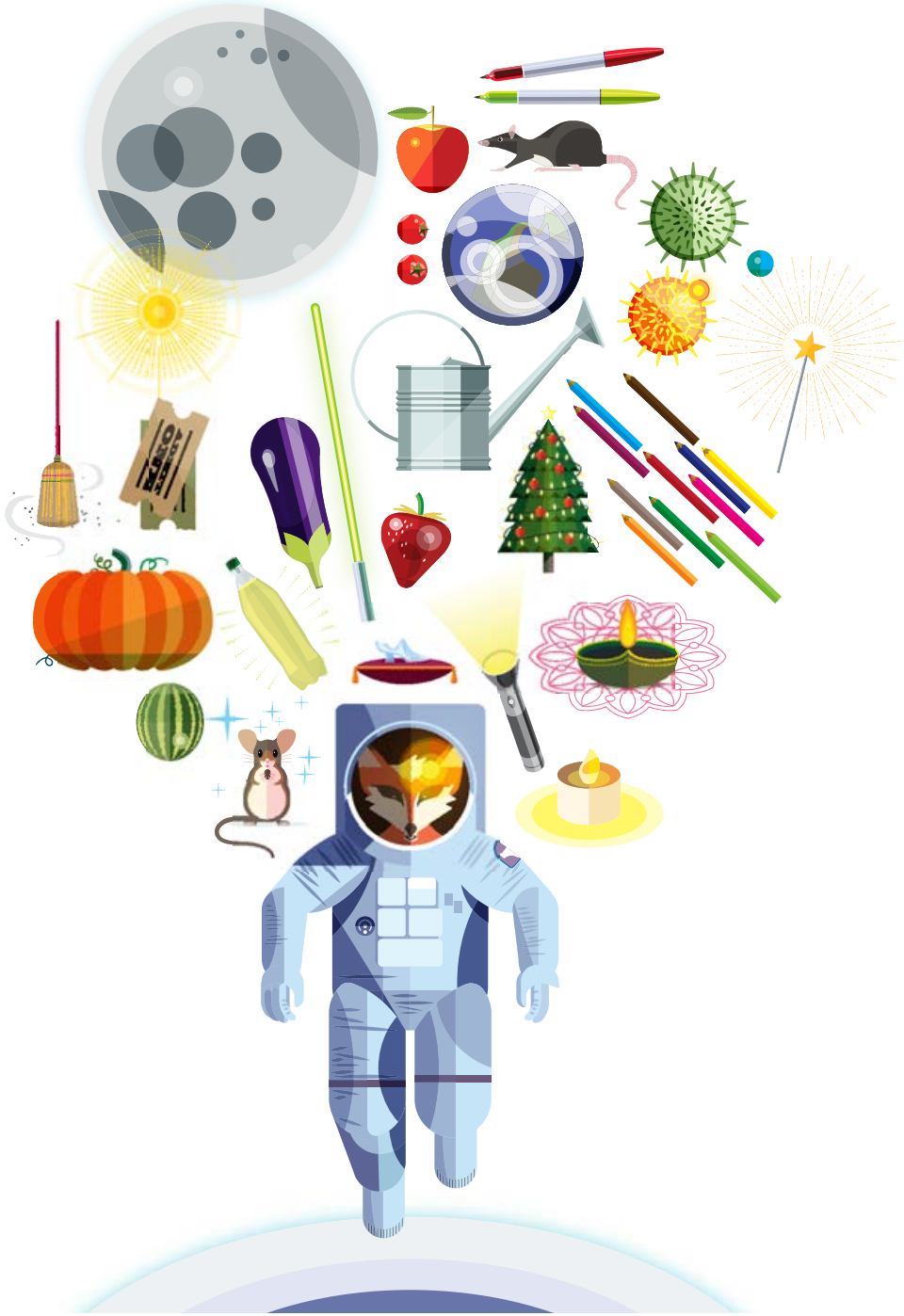
ILLUMINATING LONDON

Light is everywhere. It is vital to life, from growing plants to supporting animals in their various habitats. Light is also an important cultural and religious symbol, a special part of celebrations for many people. London uses the power of light in some very interesting ways.

In this learning pack you'll be introduced to the world of London's theatres and the ways in which our West End theatres inspired Victorian toy theatres. You'll see some beautiful pieces of art, made by some of the world's most exciting artists working with light. You'll also learn about the spectacle of festivals involving light in London, from Diwali to Hanukkah.

You'll explore growing plants in London's underground bunkers, where no natural light from the Sun gets through. Finally, you'll learn about the role of London's Greenwich observatory in monitoring our Solar System. At the heart of it, the Sun, the most important source of light for us all.

Join Fen on his journey around some of the most dazzling treasures that London has to offer.



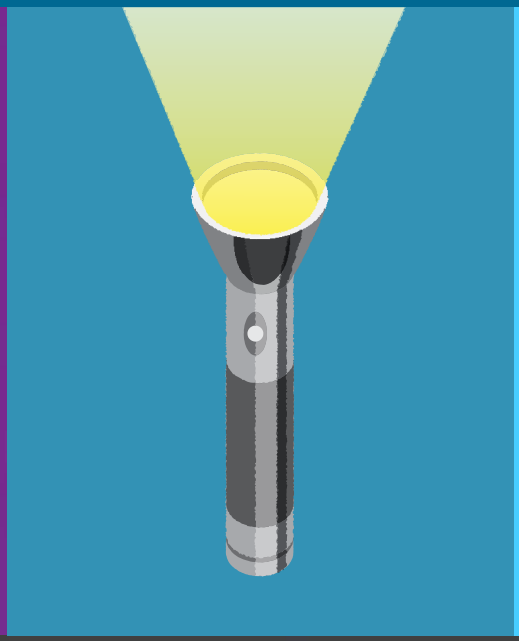
CONTENTS

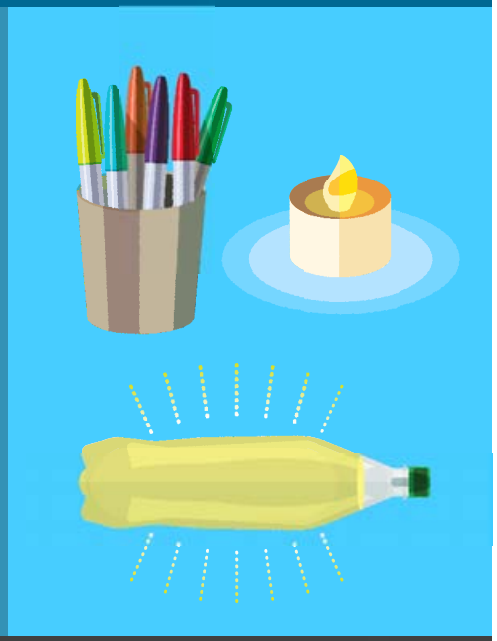
LIGHTING UP LONDON

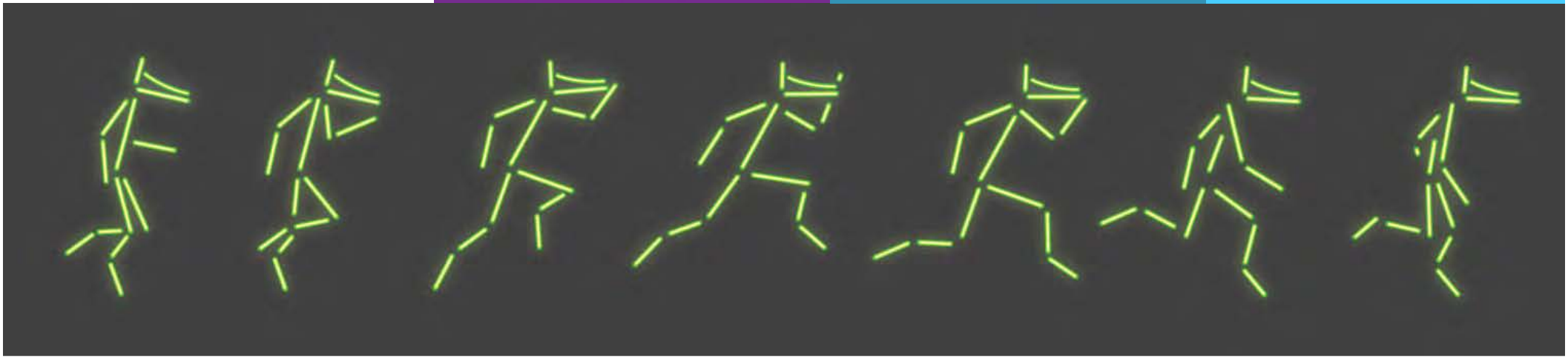
ART & DESIGN

Learning objectives

- Learn about great artists, architects and designers in history
- To produce creative work, exploring their ideas and recording their experiences
- Evaluate and analyse creative works using the language of art, craft and design



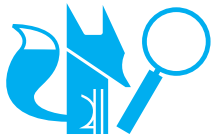




LIGHTING UP LONDON

LIGHTING UP LONDON

DISCOVER



Duration: 60 mins

Setting the scene

Share the information in Fact sheet 1: What is Light Art? (page 13) with the pupils. Then move on to introducing pupils to Activity sheet 1: Light Art analysis mind map (page 20). Go through each of the questions in the analysis section of the map so that all pupils understand the analysis questions.

Analyse the two installations explored in Fact sheet 2: Analysing Light Art together (page 17) with the whole class. Show the images of the installations and have a class discussion before reading through the analysis bullet points on the factsheet. Focus on highlighting the differences in the types of light used in the two installations (LED in *Keyframes* and neon in *Neon Dogs*).

Activity: Analysing London's Light Art

Distribute Activity sheet 1: Light Art analysis mind map (page 20). You might want to group pupils so that they can analyse the pieces of art in groups, or you may wish to ask the pupils to work independently.

Then distribute a selection/range of images from Activity 2: Images of Lumiere London installations (page 21). Ask pupils to record their analysis of the images using the activity sheet you have already distributed to them.

Discuss pupils' analysis of the different installations with the whole class.

- Which did they prefer and why?
- Which type of light did they think produced the best results and why?

You might like to use the Lumiere website to help with the feedback of pupils' analysis. You can also find out what type of light the artist used for each installation on the website. When you click on each installation you will see a small box above the title of the artwork which indicates the type of light used:

www.lumiere-festival.com

Explain that the trip element of this topic will allow pupils to analyse more pieces of light art across London and that, at the end of this unit, pupils will be able to have a go at creating their own piece of light art.

LIGHTING UP LONDON

EXPLORE

We have recommended a number of permanent light installations that are situated across London, which you can visit with your pupils. We have drawn up two walking trails which include a number of the more central light installations. These can be found in Activity sheet 3: Walking Tour Maps (page 25).

Distribute Activity sheet 1: Light Art analysis mind map (page 20) to each pupil before setting off. You might want to photocopy the page multiple times for each pupil, if they're going to be visiting more than one installation on their trip. The sheet will encourage pupils to record the pieces of art visited and analyse them, along the same lines as they did in the discover activity.

If you do not wish to follow the trails you can choose any number of the installations to visit, or indeed, if you find any local pieces of light art then you can explore them instead.

The list below highlights some good examples of light art to visit in London:

- Oversized domestic light bulbs, James Glancy Design, Ganton Street
- *Shaida Walking*, 2015, Julian Opie, installed by Artichoke as part of Lumiere London, Broadwick Street/ Carnaby Street
- *Plug and Socket*, James Glancy Design, corner of Ganton Street
- *Traffic Light Tree*, Pierre Vivant, near Billingsgate Market
- *Identified Flying Object*, Jacques Rival, King's Cross
- *Pipette* – King's Cross Tunnel, by Miriam Sleeman, Tom Sloan, Allies & Morrison, Speirs + Major
- Trinity Laban Faculty of Dance (Laban Building), Deptford
- *Vital Signs*, Spencer Finch, Brewer Street
- The light sculpture on top of the BBC building, Regent Street
- *Breathing*, Jaume Plensa, BBC Broadcasting House, Regent Street
- *Unnamed*, Southwark Council, Southwark Street
- *Swarm Study / III*, Random International, Victoria & Albert Museum
- *RN924 Wavelength*, Rob and Nick Carter, Victoria Street
- *Arch 401 – Gill Sans with Ron Haselden*, Arch 401, Great Suffolk Street

THE TRAFFIC LIGHT TREE, SCULPTURE BY PIERRE VIVANT © Adrian Chandler

LIGHTING UP LONDON

CONNECT

LITRE OF LIGHT

Activity 1 duration: 60 mins
Activity 2 duration: 60 mins

Setting the scene

Both activities in this topic involve practically creating light installations. You may choose to do both activities or, as they do not naturally follow on from each other, you may choose just one activity.

LIGHTING UP LONDON

CONNECT

Activity 1: Creating a Light Installation

Explain that in this session pupils will be working together to create their own piece of light art based on images or drawings produced during the Explore activity.

Recap on the learning in this topic to date and feed back some of the analysis of the light installations that you explored on your visit.

If the activity is followed independently, the photographs of the light installations from Lumiere London can be used as a resource. Pupils can produce their own drawings in response to the light art.

The installation will be created out of a number of cylinders of low opacity tracing paper. Each cylinder will be lit with a flickering/non-flickering LED tea light. All of the cylinders can be grouped and sited by the whole class. Once the installation is complete it should be photographed or even filmed for further display.

Extension opportunities

- To develop and enhance the installation encourage the pupils to make cylinders of different heights and widths
- Pupils could discover how felt tip pens alter the opacity of the tracing paper to create a more expressive effect
- Through using flickering and non-flickering LEDs the pupils could create an additional and more dramatic effect.

LIGHTING UP LONDON

CONNECT

Activity 1: Creating a Light Installation

You will need:

Good quality A4 tracing paper

Any drawings made on the visit or resource sheets

Felt tip pens

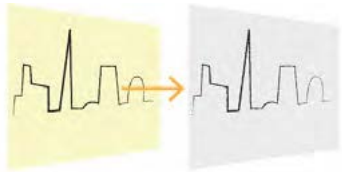
Sellotape

LED tea lights (flickering or non-flickering)

Instructions

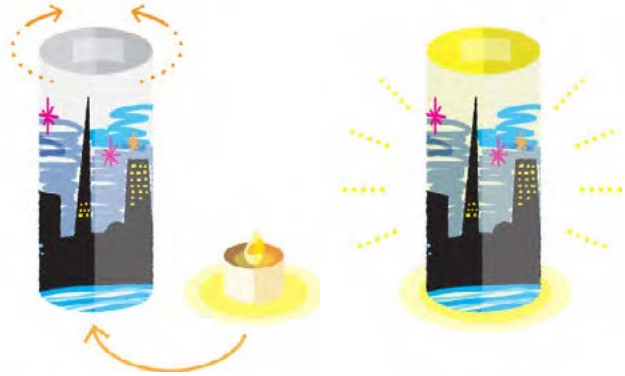
1. Using sheets of A4 plain paper (landscape or portrait) and black pens, the pupils can draw out the light installation/scene of London.

2. Once completed the drawings need to be photocopied onto tracing paper (pupils can also draw straight onto the tracing paper) – the original drawing can be kept for colouring and display with the installation.



3. The pupils can then use felt tip pens to add colour to the tracing paper copied drawings. By the addition of colour the lights will look attractive unlit and when lit they will create a tonal effect.

4. Next the pupils should make a cylinder with the tracing paper and secure it with sellotape.
5. The class or smaller groups/tables can then agree the structure/layout of the installation of the lights.
6. Once the installation is agreed the LEDs can be turned on and placed under the cylinders.
7. Photograph/film the effect.



LIGHTING UP LONDON

CONNECT

Activity 2: Litre of Light

Explain that in this session pupils will be working together to create their own piece of light art.

Recap on the learning in this topic to date and feed back some of the analysis of the light installations that you explored on your visit.

This activity is taken from the *Litre of Light* movement, whose aim is to provide ecologically sustainable and cost-free lighting for simple houses with tin rooves. In this activity, you'll be creating your own light installation which will be powered by the sun (solar powered).

More than 1 billion people across the globe live in extreme poverty with less than 80p per day to live on. Many low income families around the world do not have access to light even during the day time and cannot afford the cost of electricity, which is what we use to light our homes. Having no light means that many people can't read a book, do their homework or even cook in their homes.

Luckily, it is possible to bring sunlight into a windowless room, using just water and a plastic bottle. It is called a "solar bottle bulb" and you can create one now.

Find out more about the Litre of Light movement here:

sculptthefuturefoundation.org/portfolio/my-shelter-foundation-global-lighting-project/

Unlike the Litre of Light, you will use a cardboard box instead of galvanized metal sheets. This means that the pupils can test the lightbulb in a contained environment. By looking inside the box, they will be able to see how the bottle channels the light from outside and illuminates the inside of the box.

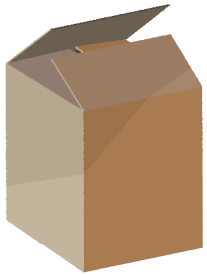
You might like to ask pupils to decorate the bottles using good quality felt tip pens, so that the resulting installation uses colour.

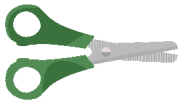
LIGHTING UP LONDON

CONNECT

Activity 2: Litre of Light


recycled bottle


large cardboard box

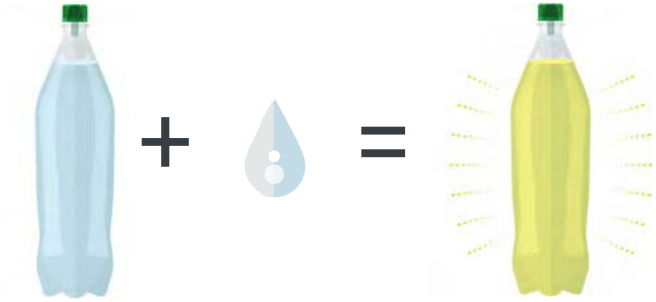

pair of strong scissors

1 litre of water


Bright torch


Felt tip pens

The technology behind Litre of Light


recycled bottle + 1 litre of water = solar light bulb

as bright as a

55

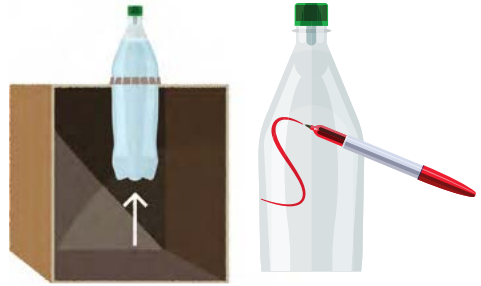
watt electric bulb

Instructions

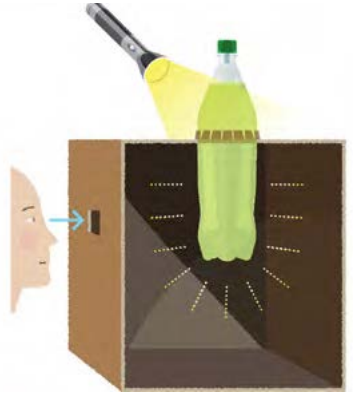
1. Draw two circles in the side of the cardboard box. The outer circle needs to be the same size as the bottle. Cut out the inner circle.

2. Cut the 1 cm difference radially, making strips and bend upwards, perpendicular to the cardboard box wall.

3. Fill the bottle with water and insert the upper third of the bottle into the hole in the box.
4. Ask pupils to decorate their bottles with felt tip pens.



4. Cut peepholes or a larger window in the opposite side of the box to the bottle.
5. Shine the torch or light into the bottle from the outside of the box.



FACT SHEET 1: WHAT IS LIGHT ART?

Light art is a form of art that is either a sculpture that uses light or projection of colours or shapes onto a surface. Throughout the history of art, light has been an influence for artists and craftsmen using glass. It was not until the twentieth century that artists were able to use light as a sculptural form. Neon tubes were used for advertising and were adopted by artists as another expressive form. In the 1960s a group of American artists formed the Californian Light and Space Group. Bruce Nauman, a member of the group has produced signs which use words made out of multicoloured neon light bulbs.

Light projections are a much more modern form of light art using floodlighting and projectors. The projections make use of existing surfaces on buildings and other constructions. Light sculptures and light projections make use of the environment around them and can be designed specifically for the space creating installations. Although light art is often site-specific many works of art are designed for only a temporary period of time.

What is an installation?

An installation is an arrangement of objects designed for a specific place and for a temporary period. Installations often use three-dimensional items.

Famous artists who use lights:

- Bruce Nauman (USA)
- Tracey Emin (UK)
- Dan Flavin (USA)
- James Turrell (USA)
- Rebecca Horn (Germany)
- Larry Bell (US)
- Olafur Eliasson (Danish)
- Robert Irwin (US)
- Ann Veronica Janssens (UK)

FACT SHEET 1: WHAT IS LIGHT ART?

THE LIGHT ARTIST'S PALETTE

The light artist uses very different materials from other artists.

Neon

If a light artist works with neon tubes, they need glass, gases and electricity. The colours of the bulbs depend on what gases are used:

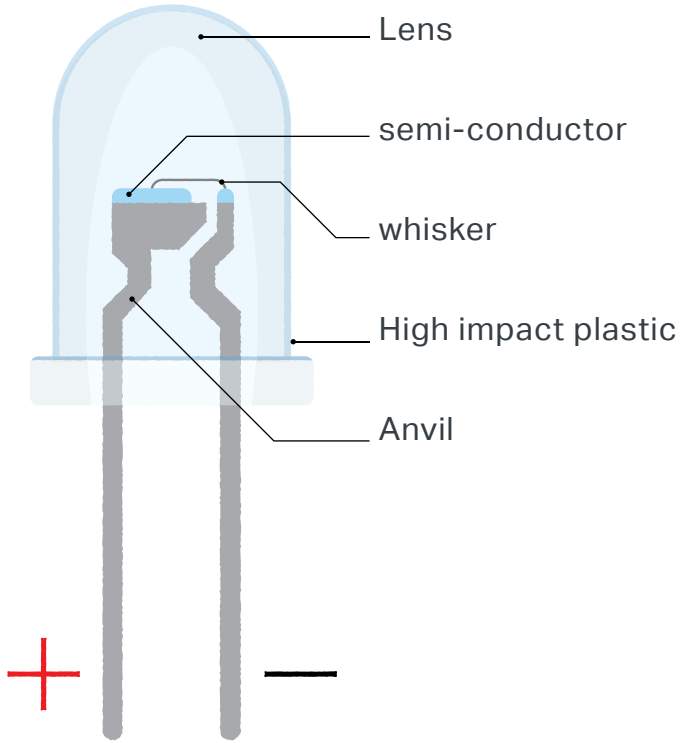
- Hydrogen will make a **red** light
- Mercury will make a **blue** light
- Neon will make an **orange** light

The neon bulb is bent into the shapes that the artist wants. Neon bulbs are quite fragile and require high voltage electricity but their colours are very impressive.

Extension:

LEDs

Unlike neon, LEDs (Light-emitting Diodes) are not expensive and because of this they are often used to create temporary installations. LEDs do not use much energy making them more environmentally friendly than neon lighting. An RGB LED can emit three colours (red, blue and green) but if they are carefully controlled they may produce up to 7 colours.



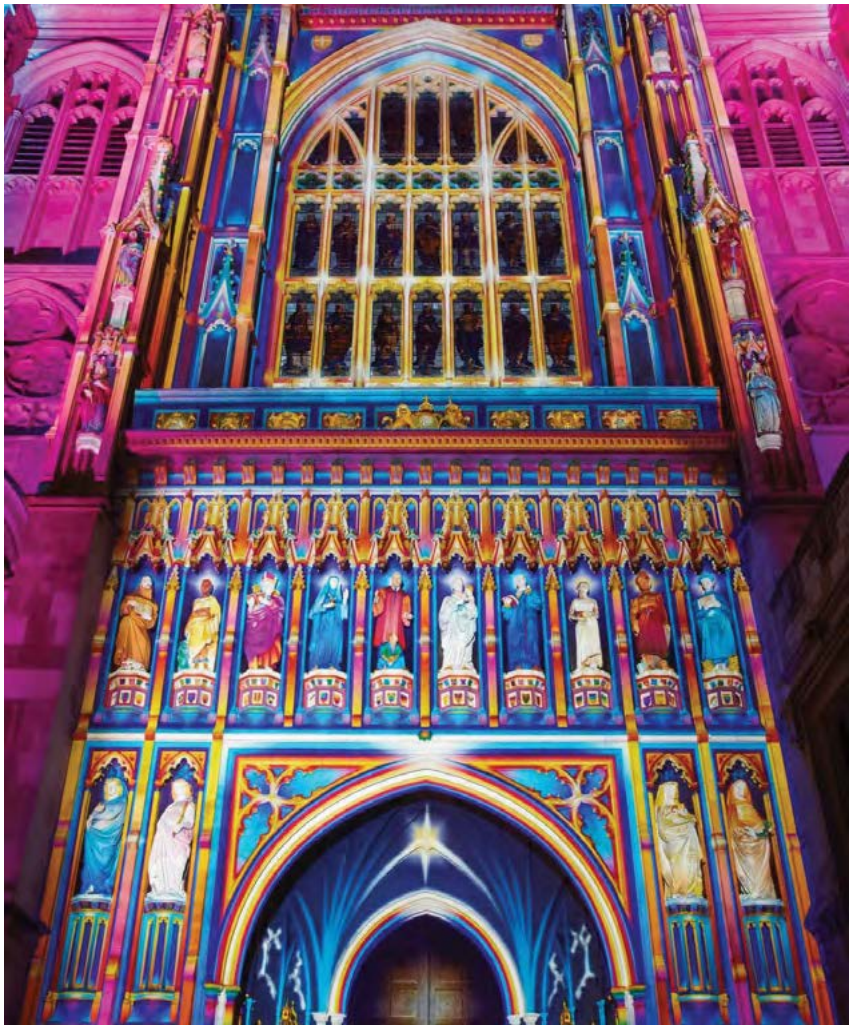
FACT SHEET 1: WHAT IS LIGHT ART?

Projections

Projectors, like ones that you have in the classroom, can be used to enhance walls and buildings with amazing images. Artists create images using computers that act like paintings on all sorts of surfaces. Sometimes known as project painting, it is possible to fit the design or painting with the shapes on the building or surface.

The projection 'The Light of the Spirit' by Patrice Warrener (France) on the front of Westminster Abbey was achieved through Chromolithe painting, a technique that projects images and colour onto architecture and sculpture. The multicoloured effect was like the brightly painted cathedrals and churches in the Middle Ages.

www.fetedeslumieres.lyon.fr/en/artiste/patrice-warrener



THE LIGHT OF THE SPIRIT, PATRICE WARRENER (FRANCE).

Lumiere London 2016, produced by Artichoke, supported by Mayor of London. © Matthew Andrews 2016

FACT SHEET 1: WHAT IS LIGHT ART?

LUMIERE LONDON

Lumiere London was a major new light festival that, over four evenings in January 2016, transformed many of the capital's most iconic streets and buildings in the West End and King's Cross. It brought together some of the world's most exciting artists working with light.

It featured a total of 30 large-scale video-mapped projections, interactive pieces and jaw-dropping installations which were spread out across London's city centre. Some of you might have been lucky enough to see them during the festival but, in this topic, you'll get the chance to analyse many of the beautiful pieces and even have a go at creating a piece of art with light yourself.

Images clockwise from top:

NEON DOGS, DEEPA MANN-KLER (NORTHERN IRELAND).
DRESSES, TAE GON KIM (FRANCE/KOREA).
1.8 LONDON, JANET ECHELMAN / STUDIO ECHELMAN (US).

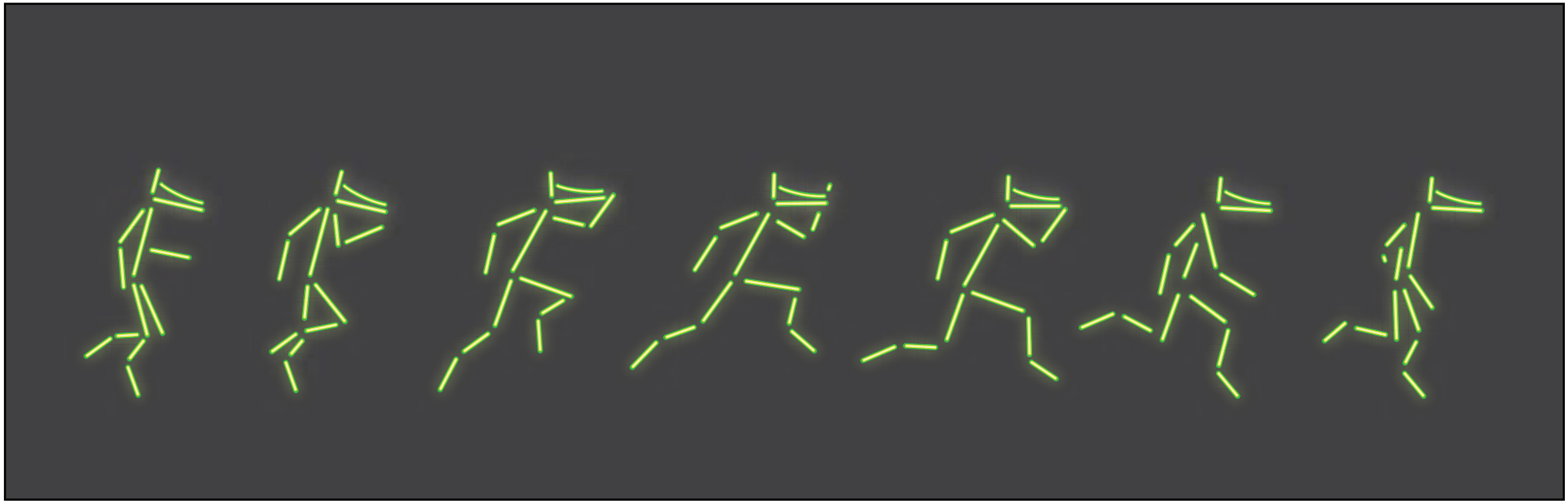
FACT SHEET 2: ANALYSING LIGHT ART TOGETHER

We'll look at two installations displayed at Lumiere London together in this factsheet. Then you'll get the chance to analyse some yourselves. Use Activity sheet 1: Light Art analysis mind map (page 20) to record your class analysis.

You can find an archive of all of the installations on the Lumiere website

www.lumiere-festival.com

The website also has films of many of the pieces which involved movement, so you can see how they looked during the festival.



FACT SHEET 2: ANALYSING LIGHT ART TOGETHER

KEYFRAMES
Groupe LAPS / Thomas Veyssiére

This installation features stick men jumping all over Liberty House on Regent Street. It was an animated sculpture. You can see a video of another installation of Keyframes in Orleans at this website:

www.groupe-laps.org/keyframes.

This will enable you to view the movement of the piece as well as the still visual.

Analysis

- The artists used LED light for this piece of art
- At first look this piece is relatively simple, with one colour light being emitted and the characters looking very similar to each other
- Once you see the characters moving the piece comes alive and they appear to swing and jump across the building
- The lines are all the same thickness and most are straight, with some curved for the heads of the characters
- The artists wanted the characters in this piece to give energy and excitement to the building, with their dancing routine inspired by video games

KEYFRAMES, GROUPE LAPS/THOMAS VEYSSIÉRE (FRANCE).
Lumiere London 2016, produced by Artichoke, supported by Mayor of London.

FACT SHEET 2: ANALYSING LIGHT ART TOGETHER

NEON DOGS
Deepa Mann-Kler

Inspired by balloon dogs at children's parties, this joyful collection of twelve neon dogs made audiences smile. Grouped together near Trafalgar Square for Lumiere London 2016, these colourful canines – complete with bones, leads and dog mess brought out the big kid inside all of us.

Analysis

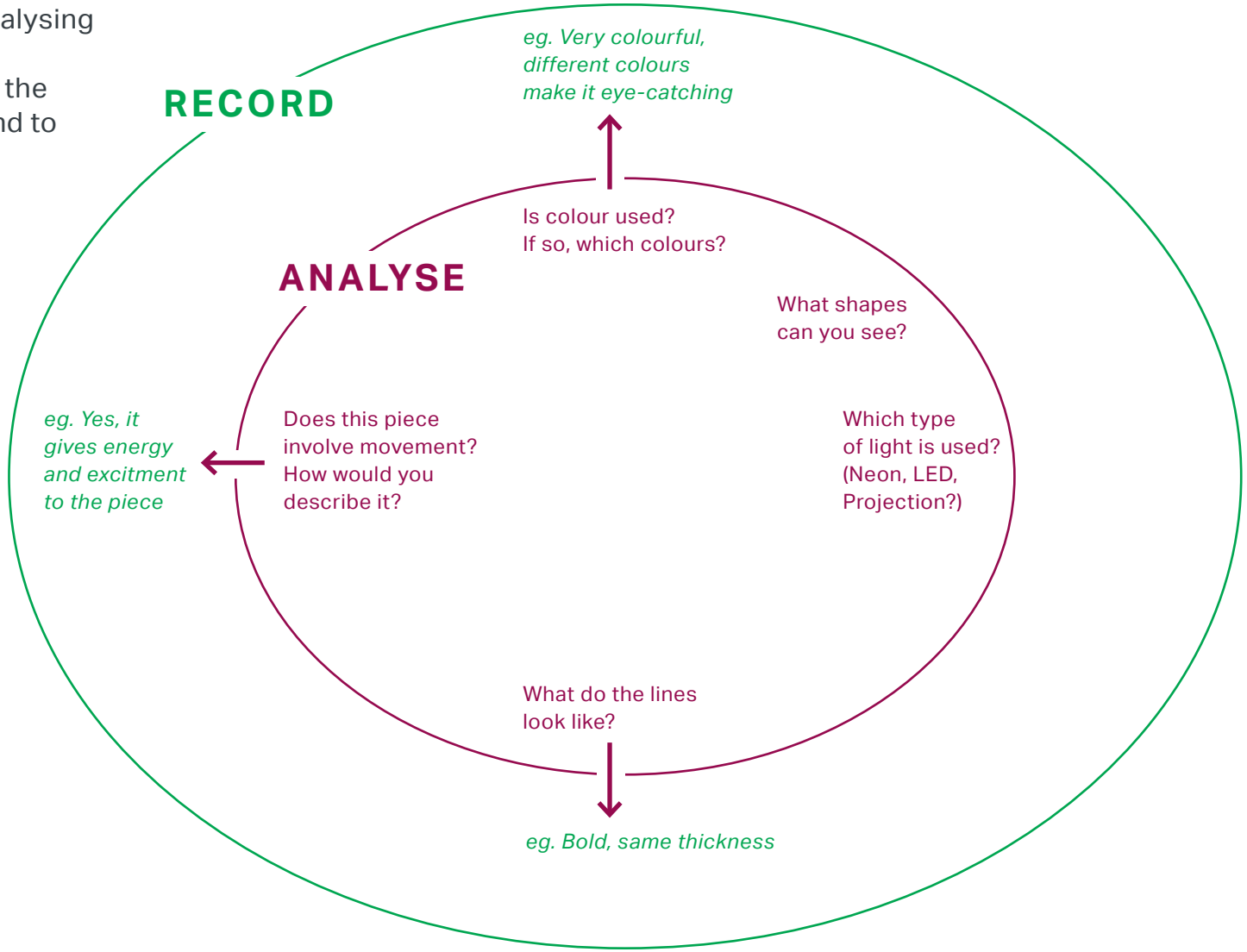
- Unlike 'Keyframes' this installation primarily uses neon light. Deepa, the artist, explained why she chose neon light: "I chose glass and neon as a medium because it conveys light; because it shines at its brightest when it is darkest and because of the fragility of the glass containing the gases. Neon can be used to illuminate ideas, feelings, memories and emotions"
- This piece is very colourful, the different colours make it particularly eye-catching
- Although there is no movement involved in this piece, the way that the dogs are positioned means that you can imagine them jumping around and being playful
- The lines are very curved in this piece to show the outline of each dog, all are the same thickness

NEON DOGS, DEEPA MANN-KLER (NORTHERN IRELAND).

Lumiere London 2016, produced by Artichoke, supported by Mayor of London.

ACTIVITY SHEET 1: LIGHT ART ANALYSIS MIND MAP

This resource will support you with analysing the piece of light art that you'll study together in your Discover lesson. Use the mind map below to analyse and respond to the pieces you study.



Name: _____

Date: _____

ACTIVITY SHEET 2: IMAGES OF LUMIERE LONDON INSTALLATIONS

GARDEN OF LIGHT, TILT (FRANCE).

Lumiere London 2016, produced by Artichoke, supported by Mayor of London.

LIGHTBENCH, BERND SPIECKER FOR LBO-LICHTBANKOBJEKTE (GERMANY).

Lumiere London 2016, produced by Artichoke, supported by Mayor of London.

ACTIVITY SHEET 2: IMAGES OF LUMIERE LONDON INSTALLATIONS

1.8 LONDON, JANET ECHELMAN / STUDIO ECHELMAN (US).

Lumiere London 2016, produced by Artichoke, supported by Mayor of London.
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LES VOYAGEURS, CÉDRIC LE BORGNE (FRANCE).

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ACTIVITY SHEET 2: IMAGES OF LUMIERE LONDON INSTALLATIONS

DRESSES, TAE GON KIM (FRANCE/KOREA).

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195 PICCADILLY, NOVAK (UK).

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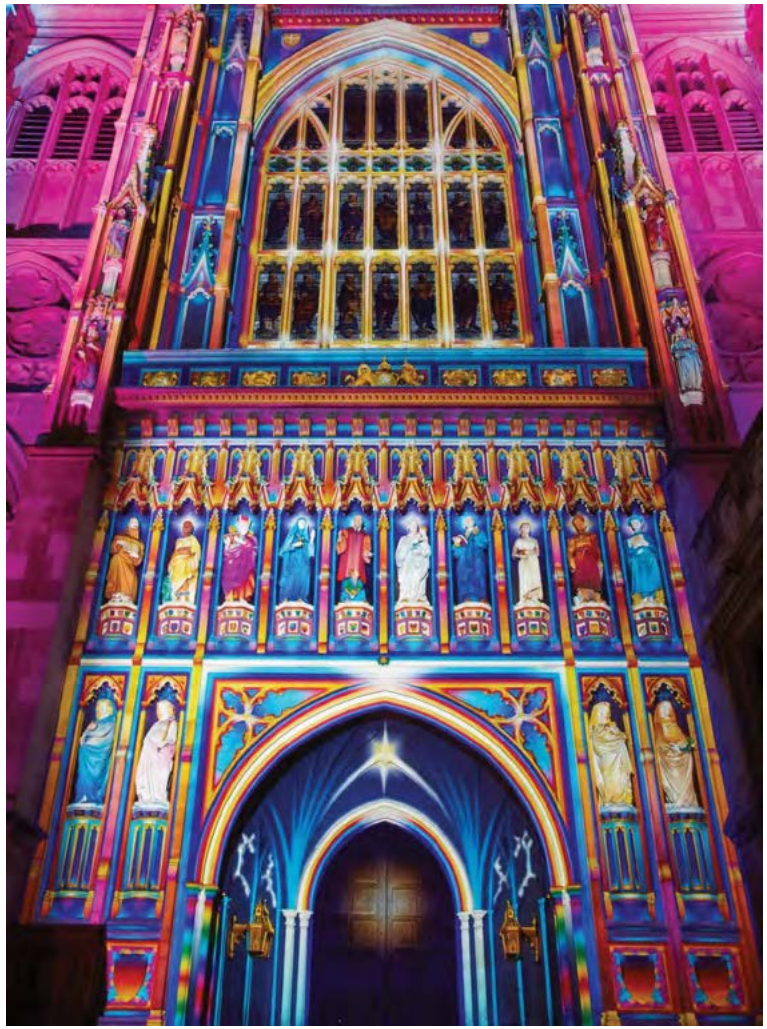
ACTIVITY SHEET 2: IMAGES OF LUMIERE LONDON INSTALLATIONS



THE LIGHT OF THE SPIRIT, PATRICE WARRENER (FRANCE).
Lumiere London 2016, produced by Artichoke, supported by Mayor of London. © Matthew Andrews 2016

ELEPHANTASTIC. CATHERINE GARRET (FRANCE),
Lumiere London 2016, produced by Artichoke, supported by Mayor of London.
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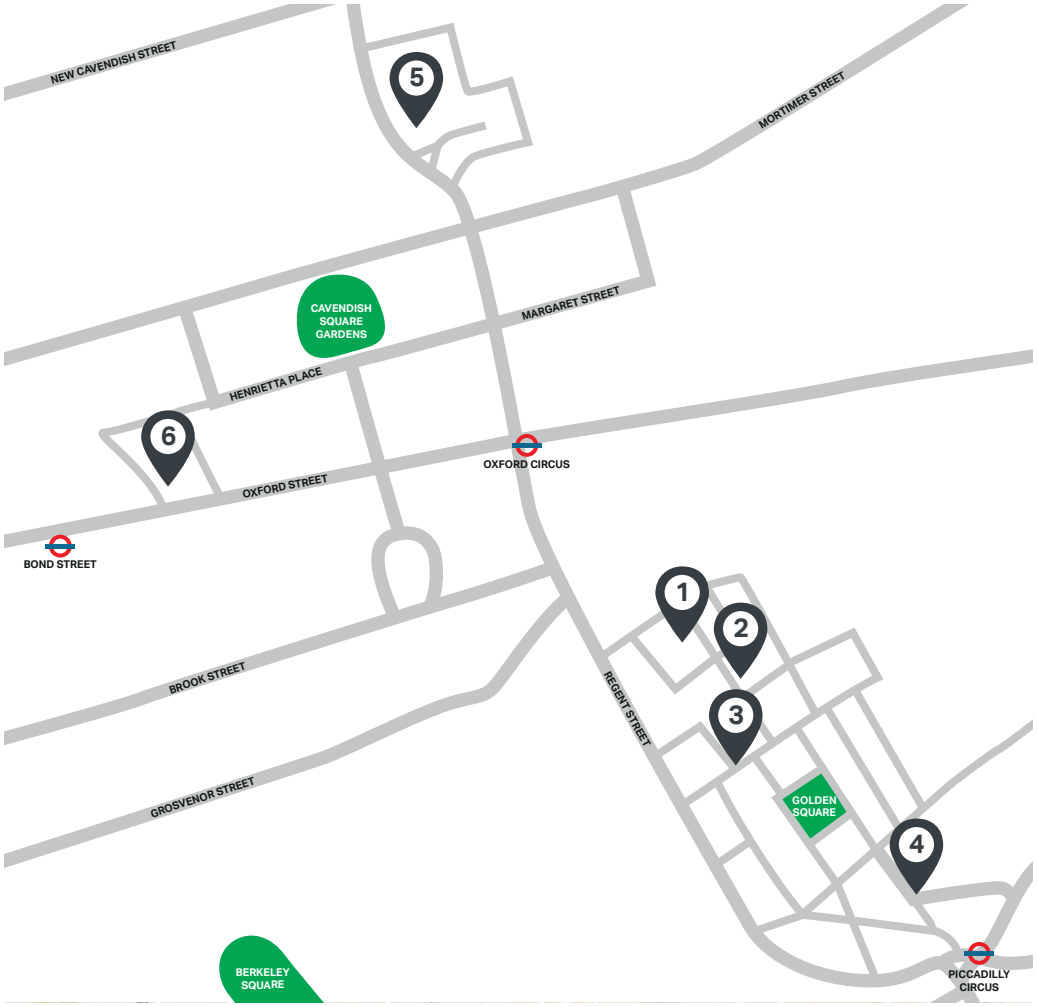
ACTIVITY SHEET 3: WALKING TOUR MAPS

WALKING TOUR 1:
GANTON STREET TO OXFORD STREET



1 GANTON ST

Carnaby Street hanging light bulb installation.

2 GANTON ST

The large light switch and plug on the corner.

1 minute walk

3 KINGLY COURT

Shaida Walking by Julian Opie, corner of Carnaby Street/Broadwick Street.

4 minute walk

4 SHERWOOD ST

Vital Signs
Brewer Street

14 minute walk

5 REGENT ST

The light sculpture on top of the BBC building.

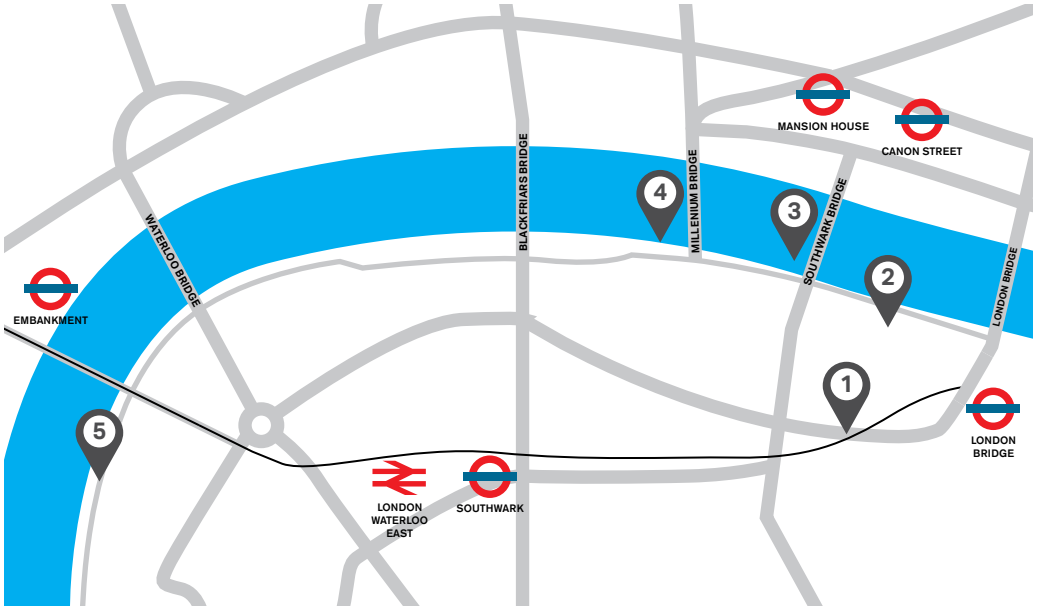
9 minute walk

6 OXFORD ST

The shimmering façade of Debenhams.

ACTIVITY SHEET 3: WALKING TOUR MAPS

WALKING TOUR 2:
SOUTHWARK STREET TO LONDON EYE



1 SOUTHWARK ST

Light art sculpture.

8 minute walk

2 CLINK ST

Clink Street Tunnel.

4 minute walk

3 SOUTHWARK BRIDGE

Southwark Bridge on Southwark Bridge Road.

5 minute walk

4 MILLENNIUM BRIDGE

Bankside Road.

25 minute walk

5 LONDON EYE

The Queen's Walk.

ACTIVITY SHEET 3: WALKING TOUR MAPS

Photo credits

Walking tour 1

1. Carnaby Street hanging light bulb installation
   Architect: James Glancey Design
   © www.carnaby.co.uk
2. *Plug and Socket*, Ganton Street
   Architect: James Glancey Design
   © Wikipedia
3. *Shaida Walking*
   Design: Julian Opie. Architect: Artichoke. Lumiere London 2016.
   © www.butterflyartnews.com
4. *Vital Signs*, Sherwood street (Brewer Street)
   Architect: Spencer Finch
   © Spencer Finch
5. The blue lit façade of Broadcasting House at night
   Architect: Val Myer
   © BBC
6. The shimmering façade of Debenhams on Oxford Street
   Design: Adrian V Montagu and Partners
   © Evening Standard

Walking tour 2

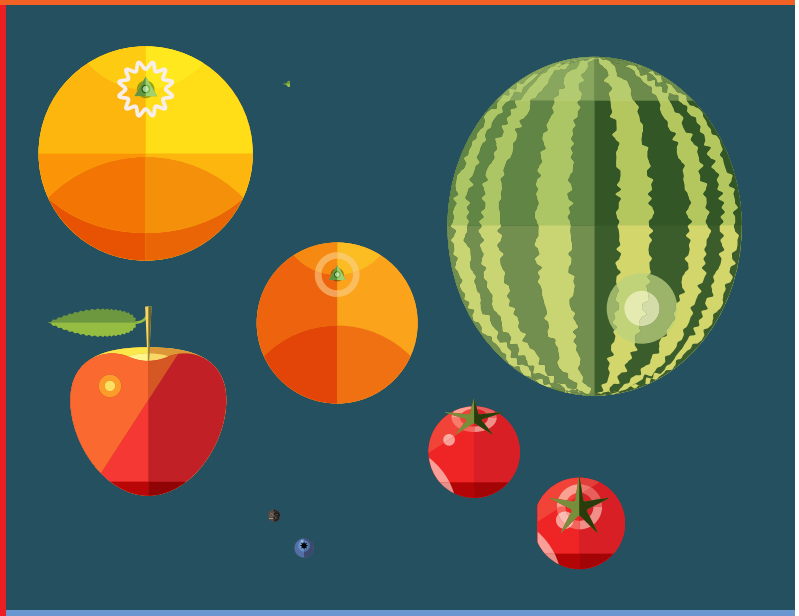
1. The light art sculpture on Southwark Street
   © Getty Images
2. Clink Street Bridge Tunnel
   © Redshift Photography
3. Southwark Bridge at night
   © Rolandas Genčas
4. Millenium Bridge at night, River Thames
   Architect: Norman Foster, Lighting Designer: Halo Lighting
   © www.rsvlts.com
5. The London Eye, River Thames
   Architects: Frank Anatole, Nic Bailey, Steve Chilton, Malcolm Cook, Mark Sparrowhawk, Julia Barfield and David Marks.
   © ahdwallpaper.com

THE SUN AND OUR SOLAR SYSTEM

SCIENCE

Learning objectives

- Describe the movement of the Earth, and other planets, relative to the Sun in the Solar System
- Describe the movement of the Moon relative to the Earth
- Describe the Sun, Earth and Moon as approximately spherical bodies
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky



THE SUN AND OUR SOLAR SYSTEM

THE SUN AND OUR SOLAR SYSTEM

DISCOVER

Duration: 60 – 90 mins

Setting the scene

This activity will support pupils to understand the various sizes of the planets in our Solar System, in relation to each other. You might like to start this session by asking some of the questions below to stimulate a class discussion and prompt pupils to make an educated guess as to which planet each item represents.

How many planets are there in our Solar System?

Can you name any/all of them?

Which planet do you think is the biggest?

Are the planets the biggest things in our Solar System?

Activity: Fruit Solar System

Share the information in the factsheet 'Exploring our Solar System' with the pupils. Ask prompting questions once the information has been read to the pupils.

Then move on to undertaking the fruit Solar System activity described below:

Equipment needed (per group):

- 1 watermelon
- 1 large grapefruit (or pomelo if available)
- 1 large apple
- 1 orange
- 2 cherry tomatoes
- 1 (large) blueberry
- 1 peppercorn

Optional: 3 large umbrellas or skipping ropes can be used to outline a large circle if preferred.

If obtaining the fruit is inconvenient, Play-Doh spheres can be made to similar dimensions for the smaller planets and bouncy balls can be used for the biggest ones.

Instructions

You can either choose to undertake this activity as a whole class, or group of pupils so that all pupils can take an active part in the activity. If you're going to group pupils then you'll need to multiply the equipment needed by how many groups you have.

Place all items on tables, either of groups, or at the front of the classroom. Start by telling pupils that four of the objects will be gas giants, as we have four planets which are gas giants. The other four will be the terrestrial (or rocky) planets. Encourage pupils to separate the objects into two groups of four, to represent the gas giants and the terrestrial planets.

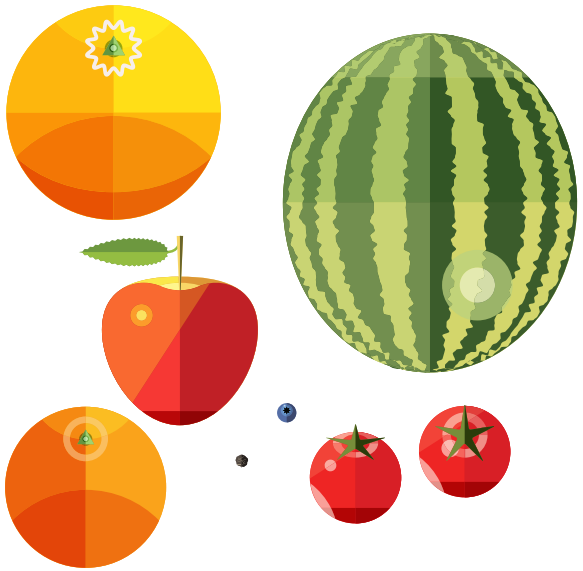
Then ask pupils to use what they learned from the 'Exploring our Solar System' factsheet to identify which planet matches with which object.

THE SUN AND OUR SOLAR SYSTEM

DISCOVER

The objects are matched to their respective items below:

- Peppercorn: Mercury
- Cherry Tomatoes: Venus and Earth (If one is slightly larger than the other, the larger one should be Earth.)
- Large Blueberry: Mars
- Watermelon: Jupiter
- Large Grapefruit: Saturn
- Apple: Uranus
- Orange: Neptune



You could give the following hints to pupils who are having difficulty with the task. You may like to print these out for less confident pupils:

- Mercury is the smallest planet in the Solar System and the closest planet to the Sun
- Jupiter is the biggest planet in the Solar System
- Saturn is the second biggest planet in the Solar System
- There are two pairs of similar sized planets, out of these four: Uranus, Earth, Venus and Neptune. Can you work out which pairs belong together and match them to the correct objects?
- One item should remain for Mars

Finally, ask pupils to order the planets by distance from the Sun. Since the distances involved are too big for the classroom, the objects can simply be placed beside each other.

Extension activity

If you'd like to extend this activity then you could ask pupils to order the planets so that there is a representation of distance. You can use the distances relative to the Sun-Earth distance which we can set as 1m. You can use the three large umbrellas to represent the Sun. Pupils will need to be able to accurately measure using a 30cm ruler and a 1m ruler (or longer if you have one). This activity is probably best completed outside or in the hall. See the table below for distances:

Mercury	40cm
Venus	70cm
Earth	1m
Mars	1m 50cm
Jupiter	5m 20cm
Saturn	9m 50cm
Uranus	19m
Neptune	30m

THE SUN AND OUR SOLAR SYSTEM

EXPLORE

Explore activities: Space In London

You might like to focus your visit on allowing the pupils to extend their knowledge of the Sun and our Solar System.

Royal Observatory Greenwich

Blackheath Ave, London SE10 8XJ
020 8312 6565
bookings@rmg.co.uk

An obvious trip to accompany this topic is the Royal Observatory in Greenwich. The museum has a comprehensive schools offer. Please note that there is a charge to visiting the museum and to accessing schools workshops.

www.rmg.co.uk/plan-your-visit/schools/royal-observatory

ROYAL OBSERVATORY GREENWICH
© National Maritime Museum, Greenwich, London

Science Dome

Science Dome has a base in London and they can bring a mobile planetarium to your hall. They offer several different shows on themes of space and the Solar System and they can do up to five shows per day for a fee.

www.sciencedome.org.uk/index.html

SCIENCE DOME
© sciencediscoverydome

THE SUN AND OUR SOLAR SYSTEM

EXPLORE

Science Museum

Exhibition Rd, London SW7 2DD
020 7942 4000
edbookings@sciencemuseum.ac.uk

The Science Museum also offers a range of school visit opportunities, as well as a specific 'we visit you' workshop entitled 'Mission to Mars.' To find out more about the visit opportunities at the Science Museum, or to book a trip, you can visit their website:

www.sciencemuseum.org.uk

The permanent exhibition 'Exploring Space' supports pupils' learning about the science of space exploration. The exhibition gives information on how we've sent spacecraft to other planets, walked on the Moon and peered into the heart of our galaxy and beyond. Find out more about this exhibition on the website:

www.sciencemuseum.org.uk/visitmuseum/plan_your_visit/exhibitions/exploring_space

Additionally, the IMAX Theatre at the Science Museum screens a range of films that are often strongly linked with space exploration. You can check the available screenings here:

www.sciencemuseum.org.uk/visitmuseum/plan_your_visit/imax

Please note that there is a charge for the IMAX screening.

EXPLORING SPACE EXHIBITION,
SCIENCE MUSEUM

THE SUN AND OUR SOLAR SYSTEM

CONNECT

Duration: 60 mins (not including setup)

Setting the scene

Recap on the learning accessed during the Explore visit. Ask pupils to share knowledge that they gained from the visit and recap on the organisation of the planets in our Solar System.

Activity series 1 presents a series of practical activities exploring the concept of Day and Night. The practical activities follow on from each other so as to build pupils' learning about Day and Night in stages.

Activity series 2 allows pupils to utilise their research skills to create a class display about the Solar System.

Activity series 1: Day and Night

This activity is about the concepts of Day and Night. It should also help pupils to understand why an ancient scholar such as Ptolemy would have concluded that the universe was geocentric.
(Earth should rotate from West to East, so that if looked down on from above they would be going anti-clockwise. But it does not matter too much for this exercise so long as each Earth spins in the same direction.)

There is also the option of an extension activity to consider eclipses and the phases of the Moon.

Tables in the centre of the classroom should be cleared to leave a large area free, then the classroom darkened.

Explain to the class that they'll be undertaking a series of practical activities about night and day. Arrange the class around the perimeter of the classroom. Encourage them to think of themselves as stars in our Solar System. They should all have torches, but their light would interfere with the experiment.

Also, it would be useful for the majority of the class (the audience) if they experienced the view from different positions relative to the Sun. However rather than all of them moving around the room each time, just get each child who plays the Sun to stand in a different position in the room. Then everyone gets to view "Earth" from the light side and the dark side.

Now follow the below series of activities, one after the other.

THE SUN AND OUR SOLAR SYSTEM

CONNECT

Activity 1A

A pupil is chosen to be Earth and stands in the middle of the room. Another pupil with a bright torch stands to one side as the Sun. Earth (slowly) rotates while the torch light is aimed at their tummy. The rest of the class sits around the perimeter of the room and calls (or whispers) out whether one particular side of Earth (the tummy) is in day or night for say four rotations.

Activity 1B

Two different pupils are chosen to be Earth and Sun. This time Earth holds a tiny character (called Tiny) in front of their tummy. Perhaps a Lego mini figure or even a small drawing of a stick person. Again as Earth rotates four times, the rest of the class will chant out whether the character is in day or night. But before they start, there is a question to think about:

Would Tiny know that she is on a planet which rotates?

After the rotations and chants the class can briefly discuss their answers. There is no reason for Tiny to think that she is rotating. All that she can see is Tummy-Land. She would think that she, and Tummy-Land, are staying still.

Pupils know that our planet spins, but do they notice? They only know it because they have been told. The equatorial part of our globe spins at 1670km/ hour. It is less at our part of the world (at our latitude we describe a smaller circle than the equator does). But even so – can we really feel, as we stand here, that we are on a planet spinning at high speed?

Activity 1C

Another two pupils have a go as Earth and Sun, again with Tiny living on Tummy-Land. Before the four day and night rotations begin, there is another question to think about:

If Tiny does not know she is on a rotating globe, how would she explain the fact that the Sun is sometimes shining on her, and sometimes not?

(She has never been to Shoulder Blade Mountains on the other side of her planet. She has no way of communicating with anyone who lives there. So she cannot realise that the other side of her world is in darkness when she is in daylight.)

After the day and night rotations, what are the pupils' thoughts? Does it seem to Tiny that the Sun travels around her?

THE SUN AND OUR SOLAR SYSTEM

CONNECT

Activity 1D

Another pair of pupils take up the roles of Sun and Earth, again with Tiny. But this time Earth rotates **very slowly** a couple of times. Audience chants not “day” and “night” but “sunrise” “midday” “sunset” “midnight” “sunrise” etc. as appropriate for Tiny character. The class considers this question:

How would the changing sky look to Tiny?

Even the audience – the Stars. Would it seem to Tiny that the Stars are travelling around her too?

Activity 1E

If teachers trust a pupil to hold their mobile phone, they could even get another pupil playing Earth to hold the phone in film mode near their tummy instead of Tiny as they rotate. This would show the view that Tiny has. Or the teacher herself could play Earth for a few rotations.

What do pupils notice when they watch the film afterwards?

Does it seem like the Sun is moving, rather than the Earth is moving?

Also watching this film, can they see the Stars which are behind where Sun is shining from? Or can they only see the brightness of the torch in that direction? From watching the screen, does it seem like the phone is on a planet which is turning? Or does it look like everything else is revolving around the Earth?

THE SUN AND OUR SOLAR SYSTEM

CONNECT

Extension

Duration: 20 mins

This series of activities can be extended to allow pupils to consider the movement of the moon.

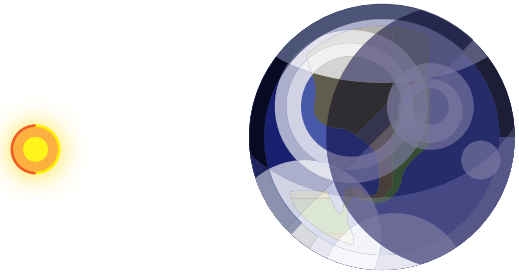
With Earth and Sun in similar positions as before, another pupil (Moon) revolves around Earth, about two metres away, given enough space. Moon always keeps their face pointing inwards towards Earth but they walk ultra-slowly, much slower than Earth's rotation. Sometimes Moon will block the light from Sun. Then they will have their back to the Sun and their front (towards Earth) will be in shadow. Tiny will experience a solar eclipse.

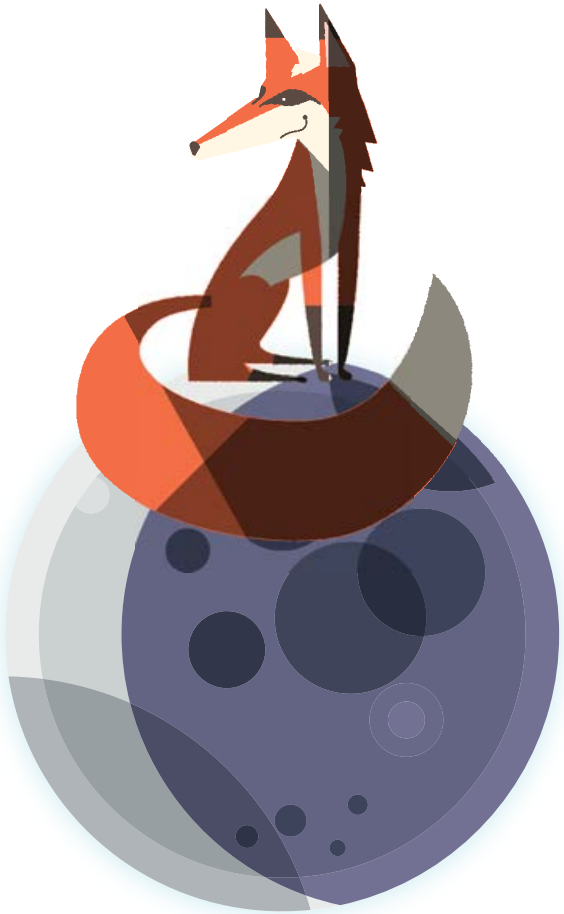
Sometimes Earth will block the light falling on Moon, a lunar eclipse. Moon's front will be in sunlight just before and straight after it is eclipsed by Earth. Sometimes only one side of Moon will seem illuminated to Tiny.

Pupils consider: *How does the light falling on the person being Moon equate to the phases of our real Moon?*

Also: *Why does the Earth not experience a solar eclipse every month?*

(It is to do with alignment. The Moon revolves around Earth at a 5 degree angle to the plane in which Earth revolves around the Sun. So it is not often that the three bodies are all in alignment.)





THE SUN AND OUR SOLAR SYSTEM

CONNECT

Duration: 150 mins

Activity series 2: Solar System Display

60 mins: research and planning.
60 mins: creating pictures and texts to share and display.

30 mins: examine everyone's information and discuss anything surprising.

Explain to pupils that this activity will support them in practicing their research skills and to work in groups to create a large class display about the Solar System.

Pupils should work in groups of three or four, and each group will be allocated a particular planet with one group allocated the Sun. Perhaps the teacher can pull a planet name "out of a hat" for each group to allocate who works on which planet.

It is recommended that pupils are directed to start their research using the 'Kids' section of the European Space Agency website:

http://www.esa.int/esaKIDSen/OurUniverse.html

Another useful source (which is mentioned on the NASA website) is called Amazing Space, pupils can scroll down the Fast Facts section:

amazingspace.org/resource/resource_index/solar_system/topic#fast_facts

Ask pupils to use the same metric units, so that all the information is easy to compare.

Also, all the statistics could be gathered into a big table as part of the display, for ease of comparison. Ask pupils to find statistics on the following, for their assigned planet:

- Diameter
- Orbital period (how long to travel around the Sun)
- Rotational period (how long to rotate on its axis)
- Temperature range or average temperature.
- How many Moons?
- Any Rings?
- Magnetic field?
- Atmosphere?
- Gravitational field, compared with the Earth?

THE SUN AND OUR SOLAR SYSTEM

CONNECT

For data on gravity, a handy website is:

www.phys.org/news/2016-01-strong-gravity-planets.html

Ask pupils to find their planet's gravity value in g. This is not to be confused with grammes. It is a convenient way of comparing the force of gravity on another body as compared with that on Earth. So Earth's force of gravity would be 1g and the force on other planets would be more or less than 1g.

In addition to the statistics gathered, each group should compose a short text about an interesting feature of their planet.

Suggestions for interesting facts include:

- Mercury: unusually heavy core and density, also the presence of (water) ice
- Venus: atmosphere and 'greenhouse effect'
- Earth: the oceans (liquid water is so unusual in the Solar System)
- Mars: Olympus Mons and the Valles Marineris
- Jupiter: the Great Red Spot and Ganymede
- Saturn: Rings and Titan
- Neptune: Great Dark Spot and wind speeds
- Uranus: Axial tilt and seasons (Uranus rotates on its side compared with other planets. This makes its seasons very different from other planets.)
- Sun: Coronal Mass Ejections and their effect on Earth.

Extension

If any groups finish very quickly, they can also do a small piece to add to the display on one of the following: the Asteroid Belt, Meteorites, Comets (including Halley's Comet). For this, it is more interesting to find general information rather than trying to gather all the statistics as above.

After the display has been created, it would be good to facilitate a discussion around the following:

- Compare the rotational periods of all the planets. Any surprises?
- Compare the temperatures of each planet, starting nearest to the Sun. Is there a surprise here too?

FACT SHEET 1: EXPLORING OUR SOLAR SYSTEM

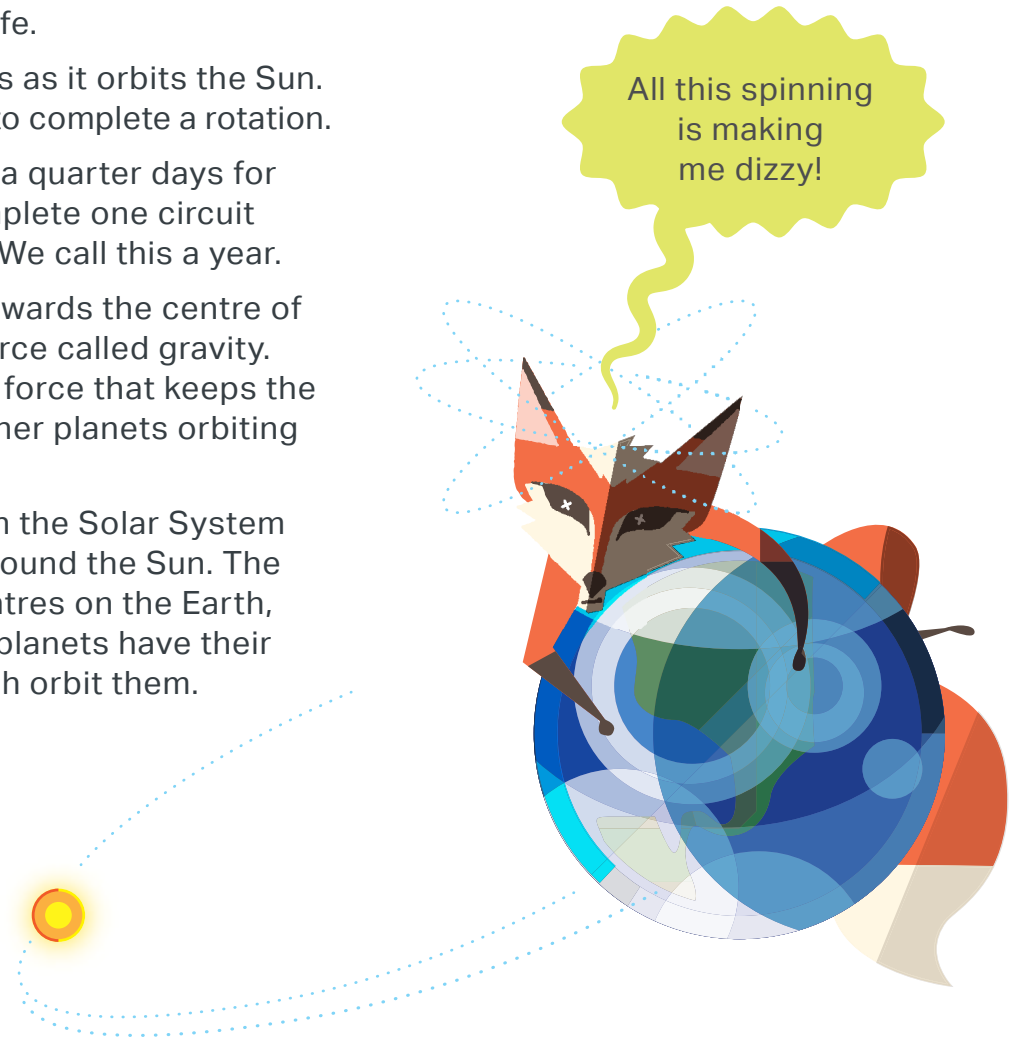
Our Solar System is fascinating. It is also very complex and it has taken scientists many years to identify how it works. This factsheet will introduce you to some of the most interesting and important facts about how our Solar System operates.

EARTH AND THE SUN
ELEMENTS OF THIS IMAGE FURNISHED BY NASA.

FACT SHEET 1: EXPLORING OUR SOLAR SYSTEM

Our Solar System: Top 10 facts

1. The Solar System includes the Sun, the Earth and seven other mainly spherical planets. Also, asteroids and comets.
2. The planets orbit around the Sun. An 'orbit' is a path or course that a planet takes around the Sun.
3. The Sun is a star – a massive spherical ball of hot gases that generates light and heat.
4. The closest planet to the Sun is Mercury, and the farthest away is Neptune.
5. The biggest planet is Jupiter, and the smallest planet is Mercury.
6. The Earth is the only planet that we know supports life.
7. The Earth rotates as it orbits the Sun. It takes one day to complete a rotation.
8. It takes 365 and a quarter days for the Earth to complete one circuit around the Sun. We call this a year.
9. You are pulled towards the centre of the Earth by a force called gravity. This is the same force that keeps the Earth and the other planets orbiting around the Sun.
10. Not everything in the Solar System orbits directly around the Sun. The Moon's orbit centres on the Earth, and many other planets have their own moons which orbit them.



FACT SHEET 1: EXPLORING OUR SOLAR SYSTEM

The Planets

The Earth is just one of eight planets that travel around the Sun.

The other planets are called Mercury, Venus, Mars, Jupiter, Saturn, Uranus and Neptune.

You'll explore the relative sizes of the planets in the Discover activity, but the mnemonic below can be used to help you remember the order of the planets:

***M**y **V**ery **E**ducated **M**other **J**ust **S**erved **U**s **N**achos*

Why not make up your own?

Can you make up another mnemonic to include the Asteroids which lay between Mars and Jupiter? They should not be ignored, after all some of the asteroids are bigger than Pluto, which is a dwarf planet.

EARTHRISE

FACT SHEET 1: EXPLORING OUR SOLAR SYSTEM

Royal Observatory Greenwich

London is home to one of the most important historic scientific sites in the world, the Royal Observatory in Greenwich.

The building of the observatory was ordered by King Charles II in 1675. For nearly 300 years, it was a working observatory, where Astronomers would investigate the positioning of the stars and planets. The first two Astronomers Royal – John Flamsteed and Edmond Halley – plotted all the stars visible in the northern and southern hemispheres.

The work of astronomers eventually led to the establishment of Greenwich Mean Time (GMT). At the Washington Meridian Conference of 1884, GMT was accepted as the time standard for the world.

You might like to find out more about the role of the Greenwich Observatory on your Explore visit. You can also find out more about the history of the Greenwich Observatory, and what it now offers as a museum, on the website:

www.rmg.co.uk/royal-observatory

SPOTLIGHT ON VICTORIAN THEATRE

ENGLISH

Learning objectives

- Writing narratives, considering how authors have developed characters and settings in what pupils have read, listened to or seen performed
- Prepare poems and play scripts to read aloud and to perform, showing understanding through intonation, tone, volume and action
- Noting and developing initial ideas, drawing on reading and research where necessary

HISTORY

Learning objectives

- A study of an aspect or theme in British history that extends pupils' chronological knowledge beyond 1066

SPOTLIGHT ON VICTORIAN THEATRE

SPOTLIGHT ON VICTORIAN THEATRE

DISCOVER

Activity 1 duration: 30 mins
Activity 2 duration: 90 mins

Setting the scene

Share the information on the Factsheet 1: London's Victorian Theatre (page 55) with the pupils. Do pupils know any interesting facts about Victorian theatre that they can share with the group? Encourage pupils to explore what it would have been like to attend a production in a Victorian theatre.

Activity 1: London's Toy Theatres

Share some of the images of Victorian Toy Theatres, from Factsheet 1: London's Victorian Theatre (page 55) with the pupils.

Facilitate a class discussion around the following questions:

- How might plays have been performed using the toy theatres?
- What types of plays might have been performed by children playing with them (e.g. pantomimes, fairy tales)?
- Can you think of some examples of characters that might have been a part of the plays?
- How do you think toy theatres were built? What materials do you think you would need?

You might like to give pupils a sense of what a performance using a toy theatre would look like by showing them an excerpt from the video performance of Ted Hawkins' 'Treasure Island' Theatre Show. You can find the video here:

www.youtube.com/watch?v=SrPS1IXi1DQ

Explain that, in the next lesson, pupils will be able to make their own Victorian Toy Theatre, ready for a performance of the traditional fairy tale 'Cinderella.'

POLLOCK'S TOY THEATRE WITH CINDERELLA

SPOTLIGHT ON VICTORIAN THEATRE

DISCOVER

Activity 2: London's Toy Theatres

Recap on the introduction to Victorian theatre that pupils explored in the previous lesson. Use the key questions presented in the previous session's lesson plan to support this recap, with a particular focus on toy theatres.

Explain that, in this lesson, pupils will be making a Victorian-style toy theatre, for the class to use in a production of Cinderella that they'll perform after their visit.

The model kit referred to in this lesson plan is kindly provided by the Victoria and Albert museum. All printables and instructions for assembly can be found at this address:

www.vam.ac.uk/content/articles/m/make-your-own-toy-theatre

The printable toy theatre presented in this pack is quite tricky to assemble and time consuming to complete.

We strongly recommend that you purchase the Cinderella toy theatre kit from Pollock's Toyshop, if you want an easier to assemble resource, and follow the assembly instructions within the resources:

www.pollocks-coventgarden.co.uk/index.php/toy-theatres/pantomime-theatre-with-cinderella.html

Pollock's toy theatre currently costs £15.95 and can be assembled with no cutting or gluing required.

POLLOCK'S TOY THEATRE WITH CINDERELLA
© Benjamin Pollock's Toy Shop, London

SPOTLIGHT ON VICTORIAN THEATRE

DISCOVER

Please follow the below instructions if you decide to make the toy theatre from the V&A website. If you decide to buy the Pollock's toy theatre, as recommended, then please use this Discover lesson to assemble it.

Instructions

You will need:

- White/cream card
- Scissors
- Glue
- Thin wooden rods, about 25cm long (kebab skewers work well)
- Sticky tack/tape

1. Print the pages of the V&A Toy Theatre Model resource on card, ideally. If you don't have card, print on paper and stick the paper onto pieces of cardboard, for example, cardboard from a cereal packet.
2. Using scissors, carefully cut out individual characters so that you have each individual piece of the model separated. You may wish to remove the characters of Alidoro, Pedro and Dandina, as they are not essential to the play.
3. Divide pupils into groups and divide the model pieces amongst the tables. There are a large number of characters, scenes and side wings to colour. Encourage pupils to think about the colours that were available during the Victorian period and to be sympathetic to the look and feel of original toy theatres. Share some of the images from Fact sheet 1: London's Victorian Theatre (page 55) to support pupils with identifying appropriate colouring.
4. Depending on the abilities of your class, you might like to have pupils undertake the colouring of the model and you might like to put it all together yourself, using Activity sheet 4: Instructions – making the support structure (page 67). If you feel that your class would be able to attach the relevant pieces of the model together independently, you might like to distribute the instructions and have the class take it in turns, table by table, to follow the steps of the instructions.

SPOTLIGHT ON VICTORIAN THEATRE

EXPLORE

There are a range of options for Explore visits, to extend pupils' learning related to Victorian London. With all visits, it is recommended that pupils are encouraged to explore the way in which lighting was used in stagecraft.

You might like to further explore Victorian Toy Theatres in London, or expand to exploring Victorian children's toys/games by visiting one of the following:

Museum of London Docklands

West India Dock Rd, London E14 4AL
020 7001 9844

The Museum of London Docklands' Sailortown gallery displays a range of toy theatre ephemera, which pupils can visit to appreciate the beauty of the toy theatres in real life. The gallery also displays a range of other Victorian children's toys, for example peep shows.

V&A Museum of Childhood

Cambridge Heath Road, London E2 9PA
020 8983 5200
mocbookings@vam.ac.uk

The V&A Museum of Childhood displays a wealth of Victorian children's toys. The museum is arranged into four main galleries – the Moving Toys Gallery, the Creativity Gallery, the Childhood Galleries and the Front Room Gallery. The Museum also offers a range of learning workshops for schools. The workshop 'Entertained By Light' is particularly recommended to tie in with the theme of this learning pack, as it explores the use of light in entertainment.

V & A MUSEUM OF CHILDHOOD

SPOTLIGHT ON VICTORIAN THEATRE

EXPLORE

Pollock's Toy Museum

1 Scala Street, London W1T 2HL
0207 636 3452
pollockstoymuseum@gmail.com

Pollock's Toy Museum displays a range of Victorian toy theatres, as well as a number of other Victorian toys. On display in six small rooms and two winding staircases are dolls, teddy bears, tin toys, folk toys, toys from around the world, dolls' houses, puppets, toy theatres, optical toys, toy soldiers and more. Please note that Pollock's is a small museum, therefore unable to accommodate large groups of pupils. You are encouraged to call ahead if you'd like to take a small group of pupils to visit the museum. There is a charge to enter this museum.

© Pollock's Toy Museum 2015

You might prefer to take pupils on a trip to explore London's Victorian theatres. For example, **the Adelphi**, **The Haymarket**, **The Royal Albert Hall** or **Wilton's Music Hall**, to name a few. If teaching this unit near Christmas time, you might like to take pupils to a pantomime to explore real-life theatre. Alternatively, you might like to visit the Unicorn Theatre, London's only theatre exclusively aimed at children:

www.unicorntheatre.com

SPOTLIGHT ON VICTORIAN THEATRE

CONNECT: LIGHTING UP THE TOY THEATRE

Activity 1 duration: 60 mins
Activity 2 duration: 60 mins
Activity 3 duration: 60 mins

Setting the scene

Reflect on the learning from the Explore trip. What do the pupils know about Victorian theatre? What can they remember about Victorian toy theatres?

Explain that, in this series of lessons, pupils will be working in groups to write a play script that follows the events of the traditional fairy tale *Cinderella*. Pupils will consider aspects of stagecraft to ensure that their play script translates well to the stage. The pupils should then be given the opportunity to present the play to an audience.

SPOTLIGHT ON VICTORIAN THEATRE

CONNECT: LIGHTING UP THE TOY THEATRE

Activity 1: Discuss and plan

Discuss the events of the traditional fairy tale *Cinderella* with the pupils. What happens in the story? Can you remember the names of the characters?

Explain that the story presented to pupils in this lesson will provide a stimulus for the play scripts that pupils will create in groups. Explain that a number of versions of the traditional fairy tale *Cinderella* exist; we'll be focusing on one version today.

By the 1870s most toy theatres were focusing on fairy tales for their presentation of pantomimes. Therefore, it is highly likely that *Cinderella* was performed by children using toy theatres in Victorian London.

Print out individual copies of Factsheet 2: The Story of Cinderella (page 57) and distribute to each pupil. Then read the story to the class/ask pupils to take it in turns to read.

Some of the language used may be quite difficult for pupils of this age to grasp, so ask pupils to underline or highlight words/ phrases that they don't understand the meaning of, as you're reading.

Then go through those words together as a class after reading the story. The words to consider include: self-important, scoured, gilded, dapple, astonished, magnificent, mistreatment, embraced.

Then share Activity sheet 1: Planning your play script (page 62) on the interactive whiteboard if you have use of one. Give each table a copy of the resource. Take pupils through each aspect of the planning sheet and discuss what kind of information pupils will need to fill in. Fill in some of the boxes with suggestions offered by the class. Explain that the characters' names must match with the names of the characters the class have already created models for, as part of the toy theatres they built during the discover activity.

You don't have to use all of the characters.

The characters' names must be:

- Cinderella
- Prince Felix
- Baron Pompolino (the step sisters' father)
- Clorinda (Cinderella's step sister)
- Thisbe (Cinderella's step sister)
- Fairy Queen (godmother to Cinderella)

Also remind pupils of the model backdrops available for their plays. Then explain that in the next lesson, pupils will be asked to work in groups to plan and write their play scripts and to think about the staging of their production.

Remind pupils of how the characters move in a toy theatre, so as to support their staging plans.

SPOTLIGHT ON VICTORIAN THEATRE

CONNECT: LIGHTING UP THE TOY THEATRE

Activity 2: Read story, write script

Discuss and agree overall structure of your play as a group:

- Introduce the example opening scene based on the Charles Perrault adaption of the Cinderella story in Fact sheet 2: The story of Cinderella (page 57). Can the pupils see how this is based on that version of the fairy tale? In small groups of 2–4, pupils should discuss how similar they want their own story to be to the original story, or whether they would like to use their creativity to change the storyline a little, while still basing it on the original fairy tale. Perhaps they could put the story in a more modern context?

You could use Activity sheet 1: Planning your play script (page 62) that you used in the last lesson to help facilitate this discussion.

- Choose who will play the narrator and each character.
- Agree how many different scenes the story needs to be broken into and where each scene will be set.
- Discuss what happens in each scene and who are the main characters (you may want to limit the key characters in each scene to help with operation of the puppets).

Improvise

It will probably help to improvise dialogue before pupils start to write their scripts.

Each pupil should take the lead for developing what their character will say, but they can work as a group to discuss and agree the dialogue as they start to write it down.

- Start to improvise using the puppet theatre if available. What do you think your character would say in this situation? What will surprise and entertain your audience?
- While they improvise some dialogue and movement of their puppets, consider how many puppets can enter each scene at the same time, and how many puppet operators can fit around the puppet theatre. Agree who will operate puppets for each scene.

Note:
Although it is preferable for the person playing a character to operate their own character puppet, you might find there is only space for 2 pupils to operate the puppets for each scene (maybe one of each side of theatre). In this case, someone could operate someone else's puppet, but the person playing this character could still speak the words for their character.

THE STARS OF VICTORIAN THEATRE

CONNECT: LIGHTING UP THE TOY THEATRE

Write and rehearse

Now pupils can move on to writing their scripts. Display Fact sheet 2: The story of Cinderella (page 57) on the interactive whiteboard. There are conventions for writing play scripts. Can the pupils work out what these are from looking at the example scene?

Explain to them that they need to:

- Set the scene (instructions on which backdrop and when they should be changed)
- Start a new line each time a new character, or the narrator speaks.
- Put the name of the speaker in a left hand margin, followed by a colon(:) You do not need to use speech marks.
- Give instructions to both the puppeteer and the actor playing the characters voice in brackets (and italics too). For a puppet theatre instructions should include on which side of puppet theatre each puppet should enter from.
- Look at the example scene again. You can use this as the first scene for your puppet show if you like, or you can write your own opening scene.

Activity 3: Rehearse and perform

In this lesson, pupils will perform their play scripts, in their groups, to the whole class, using the class toy theatre that was built during the Discover activity in this topic.

If time allows, give each group the opportunity to practice their script using the toy theatre before performing it to the whole class. Encourage pupils to think about how they could use lamps/ torches (if available) to enhance the performance of their play.

Once each play has been performed, encourage the class to peer-review the performances. Ask pupils to give three positive aspects of the performance and three areas for improvement. Suggest that these responses cover the script writing, visual performance, voicing of the characters and flow of the play.

FACT SHEET 1: LONDON'S VICTORIAN THEATRE

Victorian Theatre in London

In an age before television, cinema and computers, what did people do for entertainment?

How were the stories of heroes and anti-heroes told and preserved?

During the first half of the 19th century there were more than sixty theatres in London. Theatre-going was not only for the wealthy, or even the educated middle classes. It was the mass entertainment of its day. Ticket prices were low so performances attracted large audiences; people queued to get in and were often turned away, even though audiences were tightly packed in on wooden benches.

The experience was shared by adults and children of all ages, and spectacles such as live animals on stage and water tanks enabling life-size boats to engage in combat were staged for audiences of up to 3,000 people.

A theatre visit, especially early in the century, was not for the faint-hearted. It promised an escape from reality and the delights of being transported to other places for four or five hours, seeing several plays, interludes or a pantomime while eating, drinking, smoking, and engaging with the action. However, you did have to contend with uncomfortable seating, a smelly, hot and overcrowded gas-lit auditorium, your view being obscured by ladies' bonnets, and frequent danger of fire.

FACT SHEET 1: LONDON'S VICTORIAN THEATRE

Toy Theatres

Clever publishers soon cashed-in on the popularity of the theatre by producing 'toy theatres' for children. These were printed sheets with black and white outlines of theatre sets and characters from the most popular plays. These were cut out, coloured and assembled at home so that children could perform the plays in miniature to the delight (or not!) of family and friends.

Many of the most popular plays featured well-known characters from fairy stories and folklore, such as Robin Hood and Jack and the Beanstalk. Fairy stories were often made into pantomimes and performed with toy theatres. 'Tinsel' prints of the main characters were also produced. These were similar printed sheets but with the addition of kits of shiny metal foil, fabric and other materials that children could stick on the print to produce a colourful portrait.

Most of the toy theatre kits were based on London's West End theatres, with virtually all successful productions staged in the theatres being made in miniature.

FACT SHEET 2: THE STORY OF CINDERELLA

Charles Perrault (adapted)

There was once a very wealthy gentleman called Baron Pompolino, who lived in a very grand house. His wife had died after giving birth to one child; they had named her Cinderella. The Baron had married again, to a woman who was the proudest and most self-important woman in their town. She had two daughters from a previous marriage, called Clorinda and Thisbe, who were as proud and self-important as her. Cinderella was unlike her two step-sisters in many ways. She was sweet of temper and very kind, just like her mother who had passed away.

As soon as the wedding between the Baron and his new wife was over, Cinderella's new step mother began to show her true colours. Cinderella's sweet nature offended her step-mother, probably because it made Clorinda and Thisbe look even more horrible. Cinderella's new relatives put her to work in the house; every day she scoured the dishes, washed the tables, tended to the fire and cleaned their bedrooms. She slept in the kitchen on a bed made of straw, while her sisters slept in beautiful bedrooms on sheets made of silk.

One day, an invitation arrived for the family to attend a ball that the King's son, Prince Felix, was holding at the palace. Clorinda and Thisbe were delighted at the invitation and immediately went to their rooms to select their finest gowns to wear and decide on how to style their hair.

FACT SHEET 2: THE STORY OF CINDERELLA

"I shall wear my red velvet dress with lace trimming," said Clorinda.

"Yes, and I shall wear my gold-flowered cloak, fastened with my diamond broach," said Thisbe.

On the day of the ball Cinderella was called to help Clorinda and Thisbe with their hair.

"Cinderella, would you not like to go to the ball?" asked Clorinda.

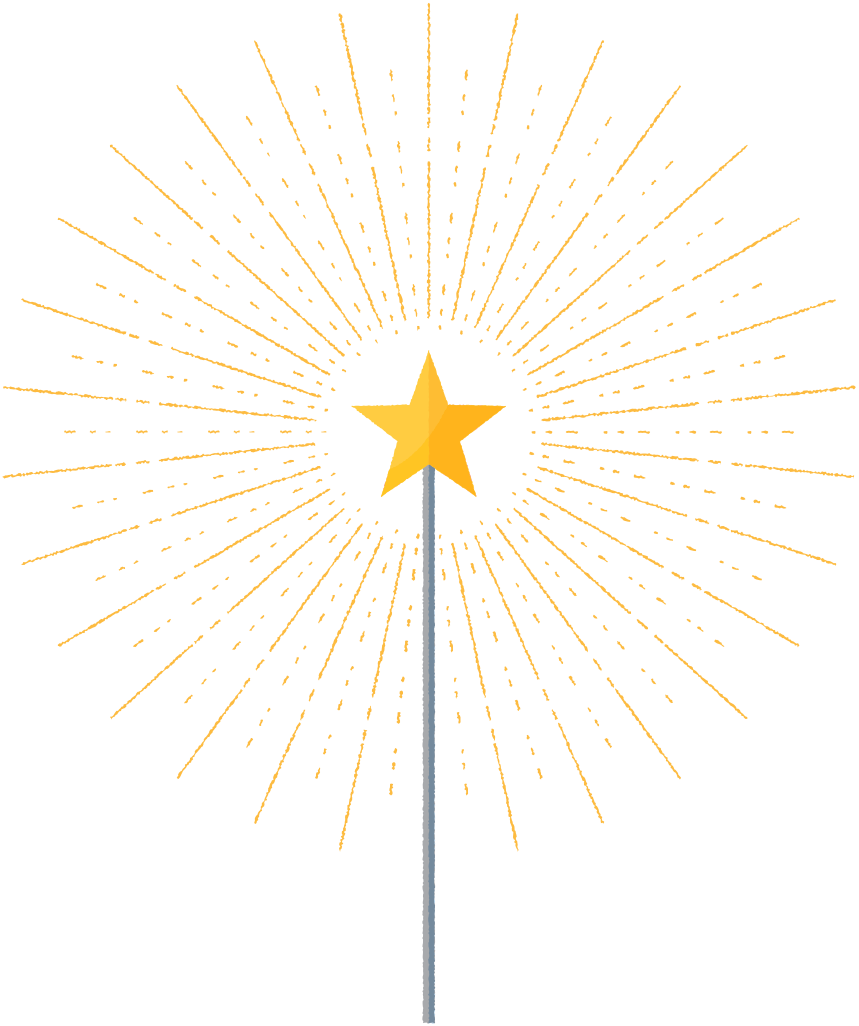
"You're only teasing me, I know I am not allowed to go to such a place," said Cinderella.

"Yes, you're right,' jeered the sisters. "The people would laugh at you if they saw you at a ball!"

Once they were suitably dressed, Clorinda and Thisbe left for the palace. Cinderella followed them with her eyes for as long as she could, wishing she was going with them. As soon as the sisters were out of view, Cinderella began to cry.

As Cinderella lifted her eyes, through her tears she saw that a Fairy Queen had appeared before her. The Fairy Queen spoke, "You wish you were going to the ball, is that so?"

"Yes," whispered Cinderella.



FACT SHEET 2: THE STORY OF CINDERELLA

"Well then you shall go," declared the Fairy Queen. "Run into the garden and bring me a pumpkin." Cinderella brought the finest pumpkin that she could find and watched in amazement as the Fairy Queen scooped out the inside of it, struck the pumpkin with her wand and instantly turned it into a fine coach, gilded all over.

The Fairy Queen then went to look into her mousetrap and found six mice, which she removed and tapped, one at a time, with her wand. They made a very fine set of six horses of a beautiful mouse-coloured dapple grey.

Cinderella continued to watch as the Fairy Queen turned lizards into footmen and a rat into a coachman. Finally, the Fairy Queen tapped Cinderella's rags with her wand and her clothes turned into cloth of gold and silver and covered in jewels.

Once this was done, Cinderella was given a pair of glass slippers, the prettiest that she had ever seen. The Fairy Queen told Cinderella that there was one very important condition under which she would be allowed to attend the ball. She was not to stay past midnight – after the clock struck 12 all of the transformations would disappear. Cinderella agreed and left in the carriage, barely able to contain her excitement.

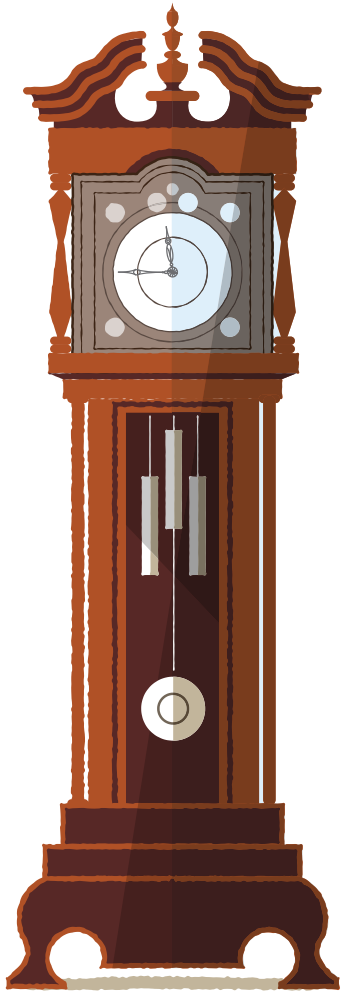
FACT SHEET 2: THE STORY OF CINDERELLA

When Cinderella arrived she was greeted by Prince Felix himself. As he led her into the ballroom everyone stopped dancing and the music ceased as everyone turned to look at the most beautiful girl in the room. The Prince asked Cinderella for a dance and the whole room watched as they glided around the floor together.

Clorinda and Thisbe were amongst all the other ladies admiring Cinderella's gown; they had no idea that they were staring at their own step-sister!

Cinderella heard the clock strike quarter to twelve and immediately made her excuses to the prince and headed back to her carriage. She told the Fairy Queen all about her magical evening, that she had danced with the lovely Prince and that all the ladies were admiring her.

The sisters came home shortly after Cinderella, by which time she was back in her old rags and lying on her bed made of straw. The sisters told Cinderella of the most beautiful princess that anyone had ever seen dancing with the Prince and their jealously was obvious. They told Cinderella that after the princess had left, Prince Felix declared that he would move heaven and earth to find her.



FACT SHEET 2: THE STORY OF CINDERELLA

What Cinderella did not know was that one of her glass slippers (which had fallen off when she rushed to return to the coach) had been found by the prince as he followed her outside. He kept it to use in his search.

The next day Prince Felix arrived at Baron Pompolino's house to ask if there were any young women living there. He told the Baron the tale of the princess that had stolen his heart and that he was desperate to find her. Clorinda and Thisbe immediately volunteered themselves as the princess that the Prince was looking for. Of course, no matter how hard they tried to squeeze their feet into the glass slipper that the Prince had brought with him, they would not fit.

As the Prince was about to leave, Baron Pompolino called to Cinderella and asked her to come into the room. The Prince was shocked to learn that another young woman lived in the house. As Cinderella came into the room, she pulled out the other glass slipper from her torn dress pocket. The sisters were astonished.

Cinderella sat down and put both glass slippers on her feet, as the Fairy Queen entered and once again turned her wand to Cinderella's clothes. She made them richer and more magnificent than before.

Sensing that they could not pay for their mistreatment of Cinderella, Clorinda and Thisbe threw themselves at her feet and begged for forgiveness. Cinderella asked them to stand up and, as she embraced them, she said she forgave them with all her heart.

Cinderella married Prince Felix a few days later. She gave her sisters lodgings in the palace and that very same day matched them with two Lords of the court.

THE END

ACTIVITY SHEET 1: PLANNING YOUR PLAY SCRIPT

What will the title of your play be?

Name the characters in your play:
Write some words next to their names to describe the characters (e.g. jealous, kind, generous, magical).

How will you make the stage look interesting during the performance?
Could you use light? Could you use sound?
Which backdrops will you use for each scene?

Name: _____ Date: _____

Use the boxes below to plan out the events in the scenes in your play:

Scene 1: Where is it? Who is there? What is happening?

Scene 2: Where is it? Who is there? What is happening?

Scene 3: Where is it? Who is there? What is happening?

ACTIVITY SHEET 2: A SAMPLE CINDERELLA SCENE

Scene 1: Introduction / Cinderella's father remarries.
Set the scene (List which backdrop should be used and which puppets you need to have ready for this scene.)

Narrator:	There was once a very wealthy gentleman called Baron Pompolino, who lived in a very grand house. (*Baron Pompolino enters from left.*) His wife had died after giving birth to one child; who they had named Cinderella. (*Cinderella enters from left.*) The Baron remarried the proudest most self-important woman in their town. (*Enter step-mother enters from right.*) She had two daughters from a previous marriage, called Clorinda and Thisbe (*Enter Clorinda and Thisbe from right.*)
Baron Pompolino:	(*Gives his new wife a loud kiss!*) Oh my dear, we will be such a happy family and our daughters will be great friends.
Narrator:	But as soon as the wedding was over, Cinderella's new step mother and daughters began to show their true colours. They made her do all the work in the house.
Clorinda:	Sweep up that mess Cinderella!
Thisbe:	Cinderella, Iron my new dress.
Clorinda:	Cinderella! Why haven't you cleaned the mud off my shoes?
Thisbe:	I bet I'll marry the richest and most important man in all of London!
Clorinda:	Not with that big nose you won't!

ACTIVITY SHEET 3: WRITING YOUR PLAY SCRIPT

Name of play: _____ Name: _____ Date: _____

SCENE 1

Location of scene: _____

Character speaking	Words and stage directions
Example: **Cinderella:**	*(left of the stage)* Oh, how I wish I did not have to spend my days scouring floors and mending clothes. Is this to be my life forever?

ACTIVITY SHEET 3: WRITING YOUR PLAY SCRIPT

Name of play: _____ Name: _____ Date: _____

SCENE 2

Location of scene: _____

Character speaking	Words and stage directions

ACTIVITY SHEET 3: WRITING YOUR PLAY SCRIPT

Name of play: _____ Name: _____ Date: _____

SCENE 3

Location of scene: _____

Character speaking	Words and stage directions

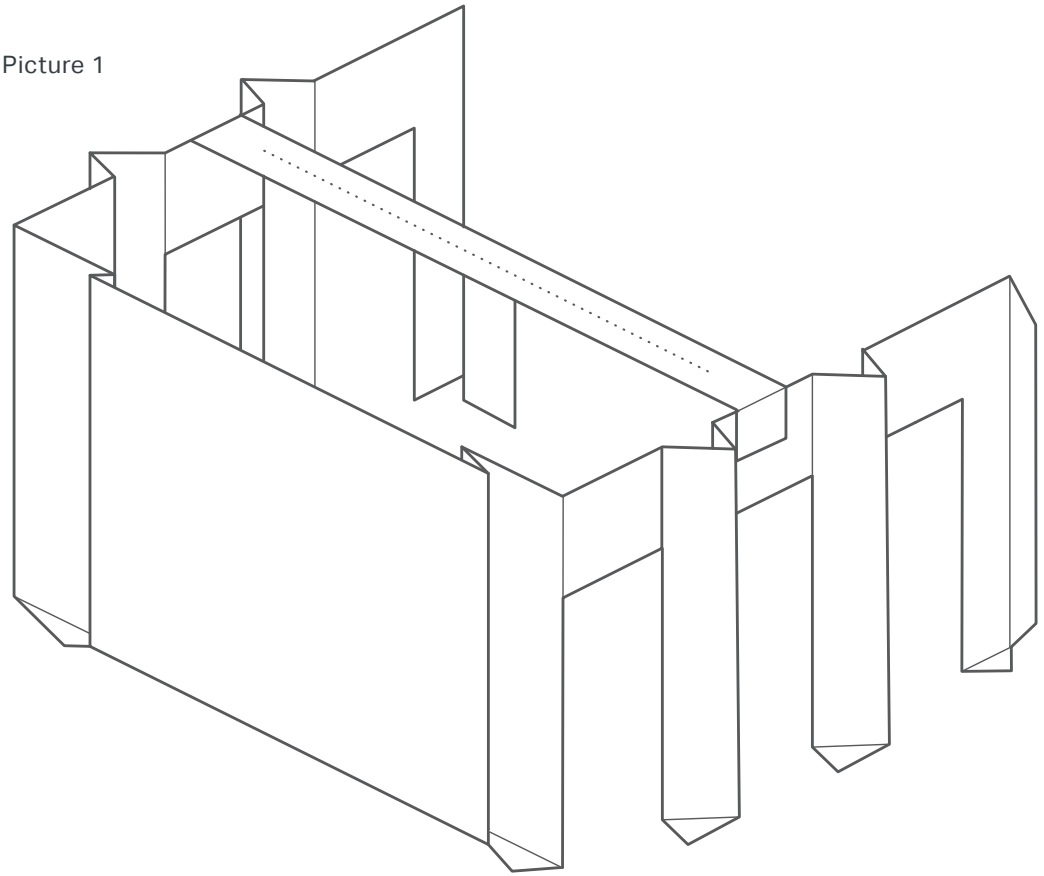
ACTIVITY SHEET 4: INSTRUCTIONS – MAKING THE SUPPORT STRUCTURE

1. Making the support structure

Take the two side panels and carefully score along the red and blue lines (to make it easier to fold, the red lines should be scored on the printed side of the line and the blue lines should be scored on the back). Fold them into shape and glue to the theatre base using the numbered tabs as a guide. Repeat for the back panel and top supports. (Picture 1).

Once in place, the top bar can be folded along its centre-line to provide more rigidity.

Picture 1



ACTIVITY SHEET 4: INSTRUCTIONS – MAKING THE SUPPORT STRUCTURE

2. Attaching the stage front

First, the stage front needs to be folded to make it stronger, and to create a 3D effect. Follow the instructions below for both the left and right sides.

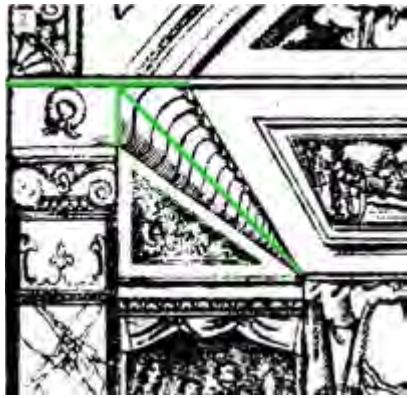
a. Cut along the lines shown in green (Picture 2).

b. Score along the red and blue lines. Tip: red lines should be scored on the printed side of the line and the blue lines should be scored on the back of the page. (Picture 3).

c. Fold the triangular parts outwards so that the rectangular tab 'A' moves to position 'B', as shown below (Picture 4).

d. Now glue the triangular parts together and glue the tab into place to create a 3D stage front (Picture 5).

Picture 2



Picture 3

Picture 4

Picture 5

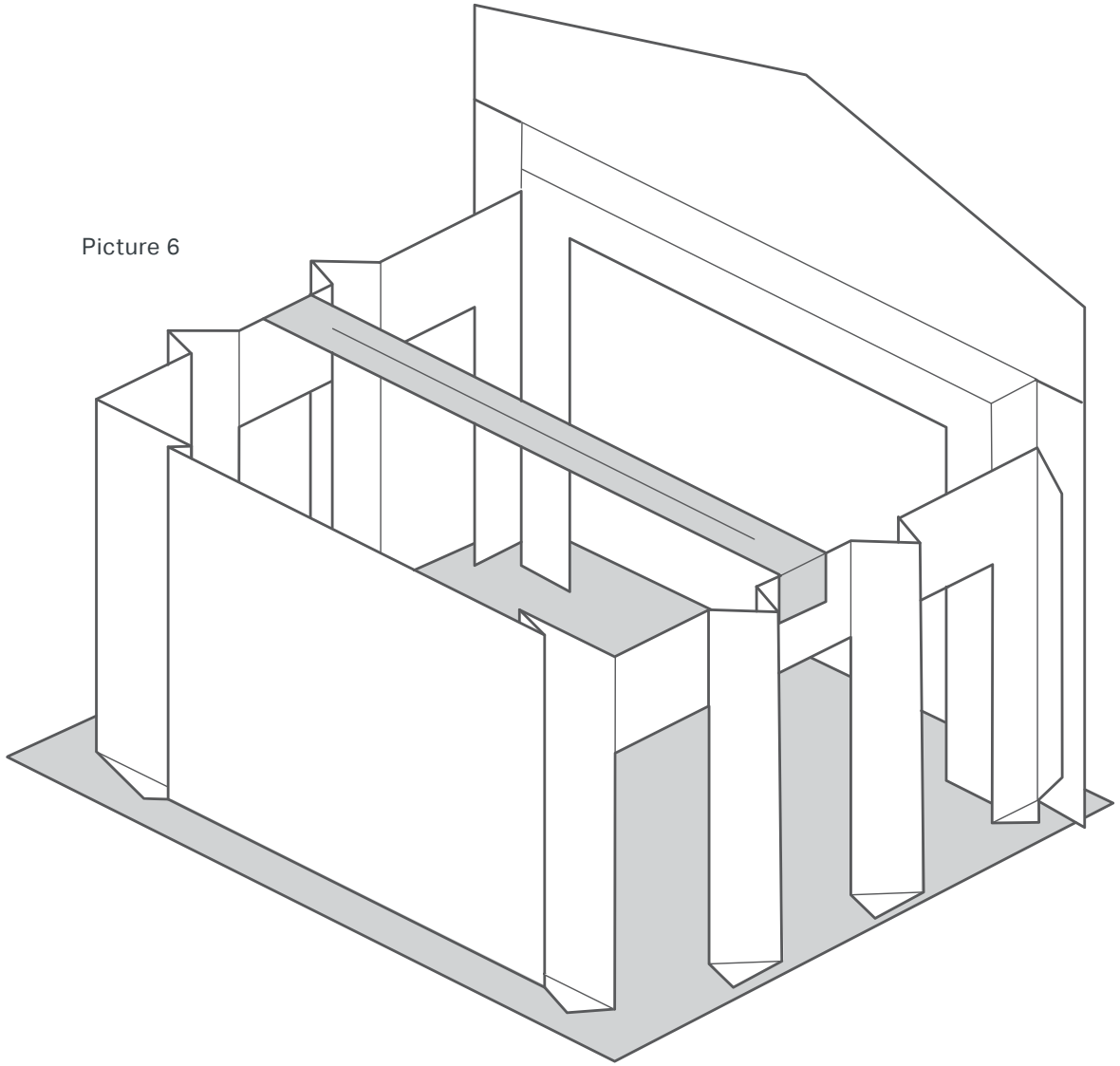
ACTIVITY SHEET 4: INSTRUCTIONS – MAKING THE SUPPORT STRUCTURE

2. Attaching the stage front, cont.

e. The stage front can now be glued to the support structure, using the long tabs to the side and the numbered tabs to the base (Picture 6).

f. Glue the side wings to the top-frame, matching the numbers. The frame should be folded along its length to make it more stable (picture 8).

Picture 6



Hint!
The bottom corners of the side wings and the backdrops can be trimmed off to allow them to be inserted into the support structure more easily.

ACTIVITY SHEET 4: INSTRUCTIONS – MAKING THE SUPPORT STRUCTURE

3. Making the character stands

Fold the character into a 'T' shape, then glue them to the wooden rods (Picture 7). Attach the characters to the stands using tape or tack.

4. Assemble the Stage

The side wings and the backdrops can now easily slide in and out of the support structure and characters can enter the stage between the side wings (See Picture 8).

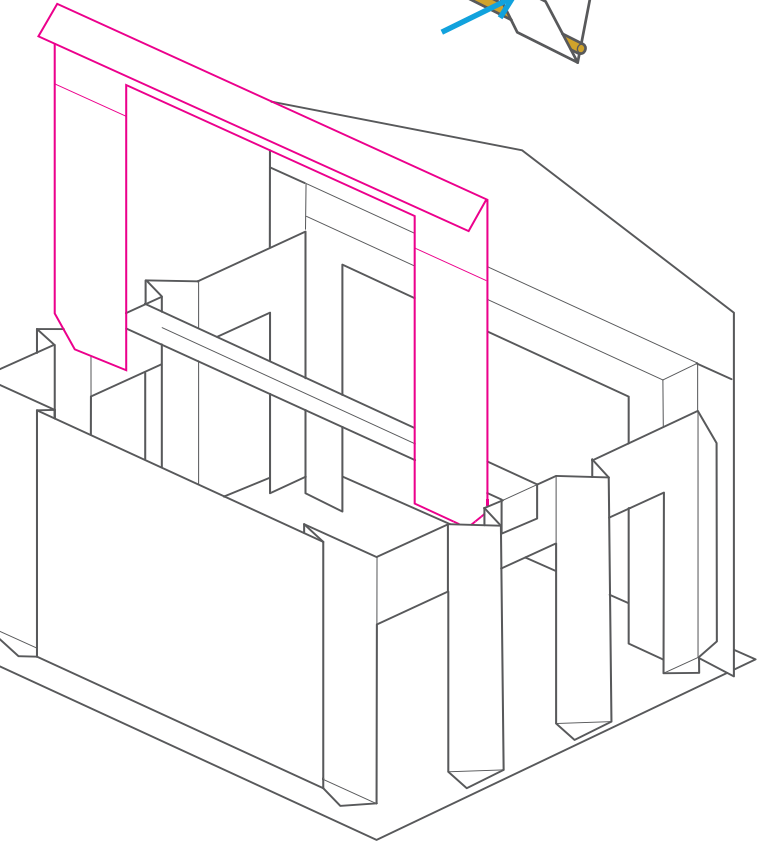
5. Show time!

Print out the pdf document 'Cinderella Script'. Follow the script to show you what to do with the characters and scenery you've created.

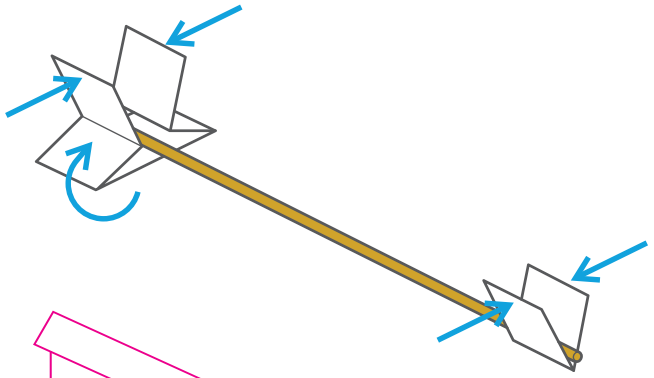
www.vam.ac.uk/content/articles/m/make-your-own-toy-theatre

Now, with the theatre complete, your script ready and the characters waiting in the wings, the play can begin!

Tip!
If you print in colour, the characters' lines are blue, stage directions are dark red, instructions for the set are green and the commentary is grey.



Picture 7



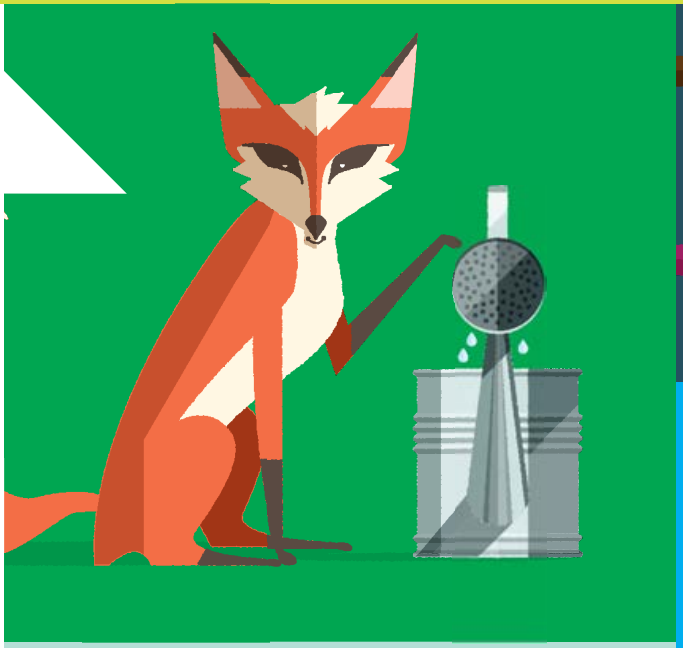
Picture 8

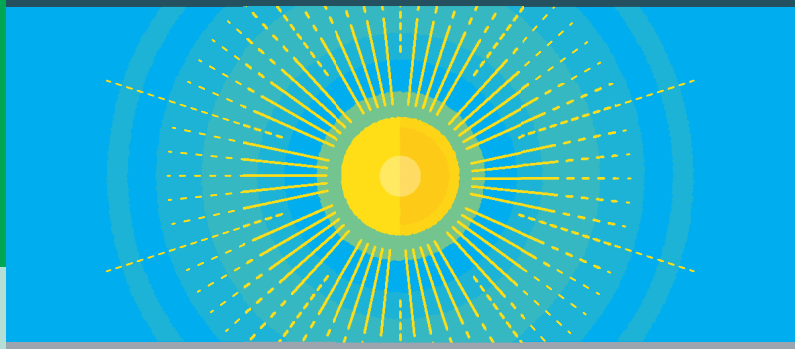
LIGHT AND GROWING

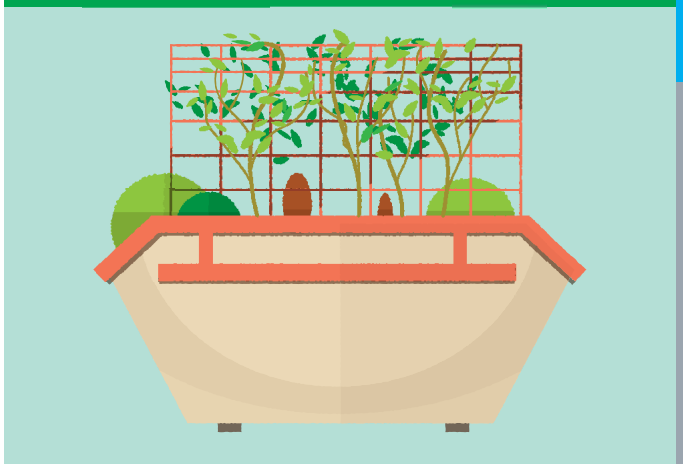
SCIENCE

Learning objectives

- Observe and describe how seeds and bulbs grow into mature plants
- Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy
- Set up simple practical enquiries, comparative and fair tests.
- Identify differences, similarities or changes related to simple scientific ideas and processes







LIGHT AND GROWING

LIGHT AND GROWING

DISCOVER

Activity 1 duration: 45 mins
Activity 2 duration: 45 mins
Activity 3 duration: 45 mins

Setting the scene

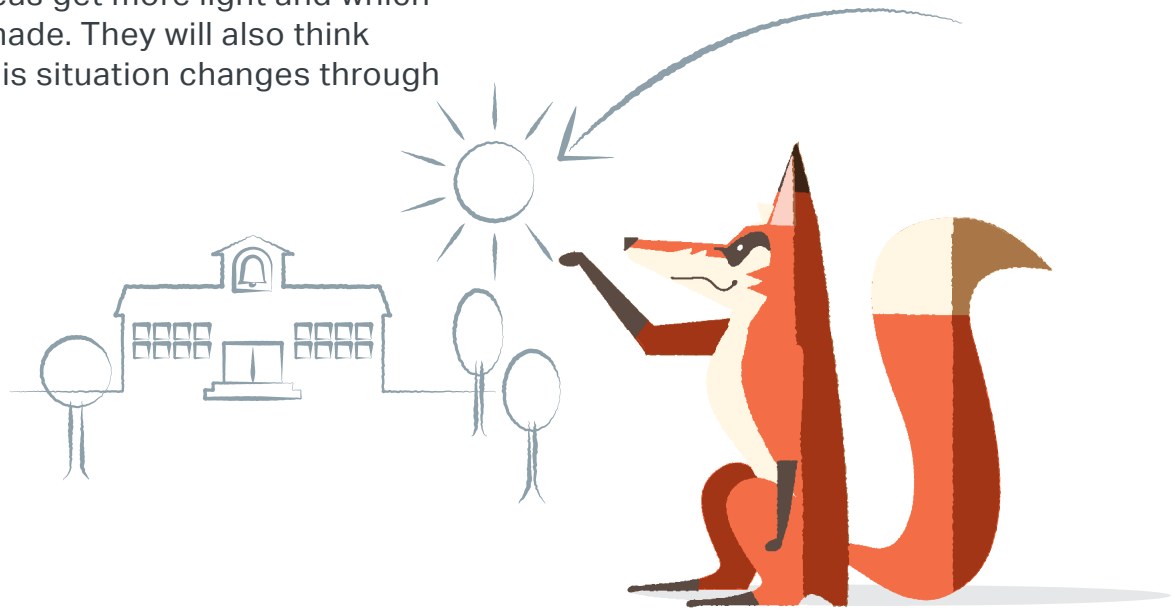
Explain to pupils that, in this topic, they will be exploring urban growing, by looking at examples of urban farms in London and by conducting experiments to learn how things grow in their surrounding communities.

There are three Discover activities to choose from in this topic; they follow on from each other but you don't have to do all activities.

Explain that designers of school grounds need to carefully consider the light and shade of their patch of ground. It is useful to know which parts get the most or the least light. This is especially true in cities, where plots can be shaded by tall buildings. If sun-loving plants are positioned in areas that are usually in shadow, the plants will not grow well.

Sometimes there can be too much light. Playgrounds for small children often have an area which is shaded by a canopy so that they can shelter from hot sun in the summer time.

In the first activity, pupils will survey the school buildings and grounds to work out which areas get more light and which have more shade. They will also think about how this situation changes through the day.



LIGHT AND GROWING

DISCOVER

Activity 1: Thinking about shadows

Share Activity sheet 1: Map of Lumiere Primary School (page 86) with the pupils, and get out the colouring pencils. Blue can be used to show areas in shadow, yellow can be for places where the sunshine is hitting full-on.

If you are working in Years 3/4, you could ask the class to predict areas of light by colouring areas in blue if they predict that they will be in shadow, and colour areas in yellow if they think that they will be in sunlight.

If you are working in Years 5/6, you might like to ask half the class to shade their map to show where the shadows will be in the morning (when the sun shines from the East) and the other half can use their colours to show the situation in the afternoon (when the sun shines from the West).

Pupils should pay attention to the heights of the different buildings. Will some cast longer shadows than others?

Let pupils compare their map with someone from the opposite group. Do they agree with each other's work?

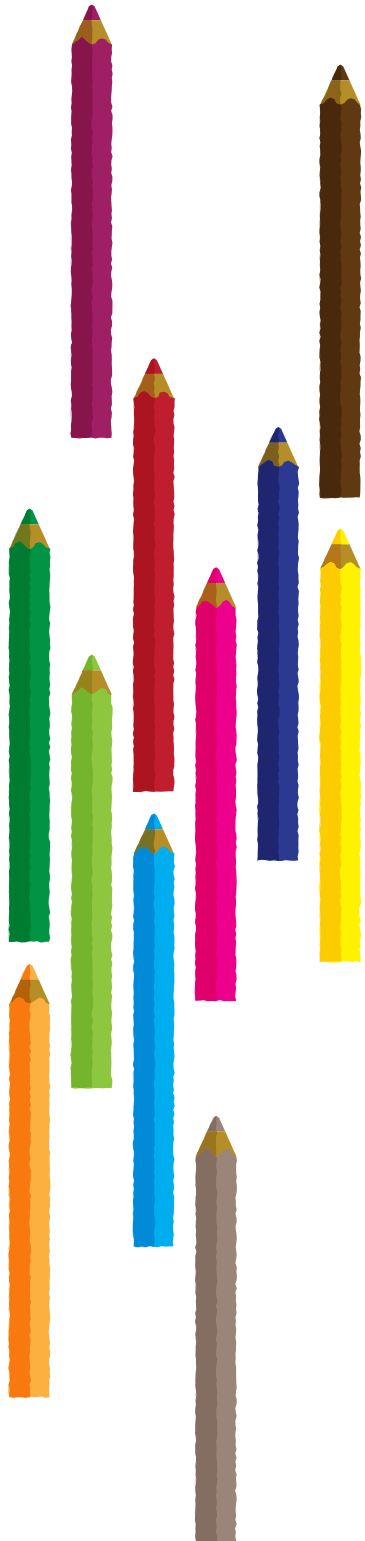
The trees should also be considered: will some of them get less light than the rest?

Is the car park in a sensible place? Does it need full sunlight?

Extension Activity

Pupils can discuss the colouring these maps will need in the summer when the Sun is at its zenith. At what time will this be, allowing for British Summer Time?

Why do we not notice many shadows outside when it is a very cloudy day? The sun must still be there, even though we cannot see it. (We are all under the massive shadow of whichever cloud is in the way.)



LIGHT AND GROWING

DISCOVER

Activity 2: Looking for shadows

Take playground chalks (of any colour) outside around the school grounds to mark the extent of shadows at different times of the day. The chalks can be used to show the outline of shadows on the playground and any other places where appropriate.

This can either be done by all the pupils at both times, or there can be half the class in a 'Morning Team' to mark shadows at say 10am and the other half of the class can be in the 'Afternoon Team' at say 2.30pm.

It must be a relatively sunny day, but if the morning starts out bright and then it suddenly rains in the afternoon, the Afternoon Team will have to wait for a better day.

WARNING: remind pupils that they are looking at shadows and they should never look directly at the sun. If they want to find the position of the Sun, they can face their own shadows and know that the Sun is behind them.

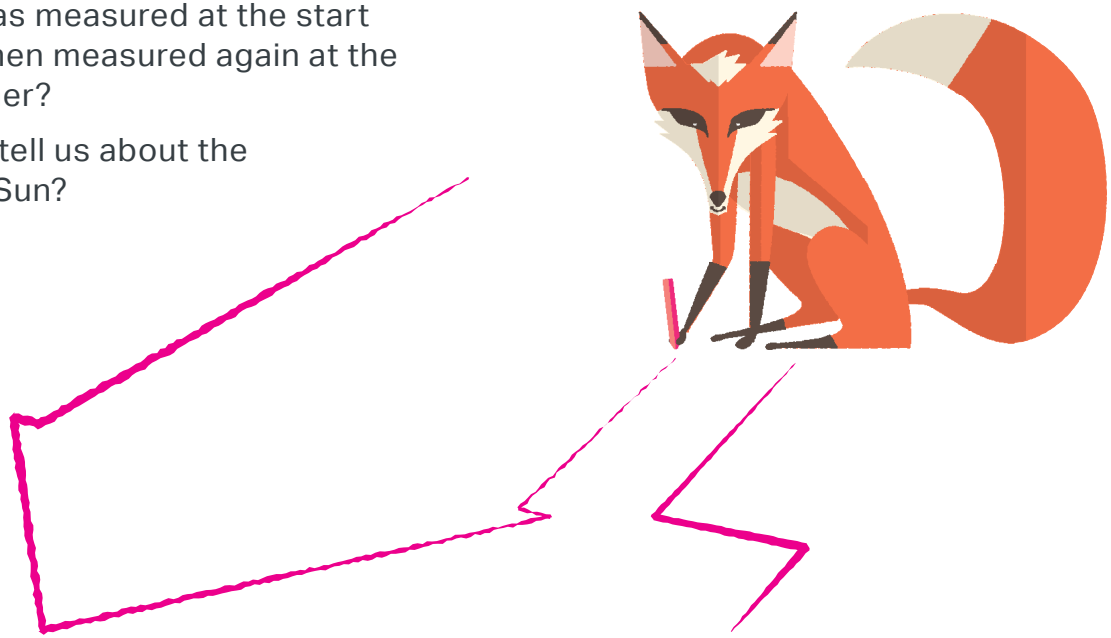
Extension Activity

More confident pupils can consider seasonal variations while conducting this survey.

How would the length of shadows be different at another time of year? To make this fair they would need to be observed at the same time of day on each occasion.

Would the midday shadow of an object be the same if it was measured at the start of Spring and then measured again at the height of Summer?

What does this tell us about the position of the Sun?



LIGHT AND GROWING

DISCOVER

Activity 3: Mapping the Shadows

Ask pupils to draw a simple map of their school grounds showing the main buildings and other areas. It does not have to be perfectly to scale, although they may benefit from doing a rough version first, to make sure they fit the main parts on.

This can be done individually or in small groups on A4 or A3 paper. Alternatively, you might like to draw an outline of the school grounds and distribute that to the class.

They may find it useful to look at a Google Earth image of the school and a large-scale local map before you begin.

Can they shade their map to show which parts will be sunny or shady at a particular time of day? They should use a compass to find East for the Sun's position in the morning.

If the school wanted to turn some of the grounds into plots for growing fruit and vegetables, which areas could be used? Would any rooftops be suitable?

How about light and shade inside the school? When the lights are turned off in the classrooms and in the hall, how far inside does direct sunlight fall? Does one side of a particular school building get more sunlight in the morning?

LIGHT AND GROWING

EXPLORE

Explore activities: Growing in London

Before going on your trip, share Fact sheet 1: Growing in London (page 84) with the pupils. This will give them a unique example of urban growing in London, and should stimulate their interest for their trip.

If you have a small gardening area in your school grounds, you might like to use that for a lesson learning outside the classroom. Alternatively, you might like to take the pupils to a local allotment. Contact your local allotment association first, to gain permission and access. Or you could visit a local crop growing area to explore another example of urban growing.

Some good examples of these include:

Hackney City Farms

1a Goldsmiths Row, London E2 8QA
020 7729 6381
education@hackneycityfarm.co.uk

This site was used by farmers and market gardeners as far back as the early 1800s. It was established in its current form in 1984 and is home to many animals. School groups can visit free of charge if teachers organise their own activities, but you must book in advance.

Various workshops run by the staff are available, including one on Growing Food.

It is also interesting to note the Projects section of their website, especially the Haggerstone Orchard Project which turned an underused area of a park into a food forest for the local community to enjoy picking and eating fresh fruit.

www.hackneycityfarm.co.uk/projects/haggerston-orchard

HACKNEY CITY FARM
© Yukino Miyazawa

LIGHT AND GROWING

EXPLORE

Stepney City Farm

Stepney Way, London E1 3DG
020 7790 8204
info@stepneycityfarm.org

A working farm in the East End, this is also a Rural Arts Centre and a community meeting place. There are three workshops with large glass fronts so the artists can be viewed at work, keeping alive traditional trades, crafts and arts.

30 pupils is the maximum that can be accommodated but teachers can conduct self-guided tours, or take up one of the many workshops on offer. Reading the list of ideas is like viewing a cornucopia of delights, with many aspects of food growth covered, also pollination and even waste management.

www.stepneycityfarm.org/learning-and-courses/workshops

It is very helpful that the education team here also put forward lots of ideas for post visit work, including suggestions for literacy,

Chelsea Physic Garden

66 Royal Hospital Road

Chelsea

SW3 4HS

http://chelseaphysicgarden.co.uk/learning/school-visits/

Tucked away beside the Thames, Chelsea Physic Garden is the oldest botanic garden in London. Its walls shelter a unique living collection of around 5,000 different edible, useful, medicinal and historical plants. The Garden offers a wide range of educational experiences for school groups, which can be suited to cover many garden-related topics. They also offer outreach to schools. To learn more about their offers, visit their website or email

education@chelseaphysicgarden.co.uk.

STEPNEY CITY FARM

CHELSEA PHYSIC GARDEN

LIGHT AND GROWING

EXPLORE

GrowUp Farms

box@growup.org.uk
www.growup.org.uk

This very interesting project uses aquaponics. The main growing area, Unit 84, is a working farm and not open to the public apart from its visitor centre.

However the GrowUp Box is set up as an example of what communities can achieve themselves. This is on the roof of a large car park in Stratford (E15) and school visits can be arranged by email.

It is also possible to organise outreach visits, with talks about their project and growing activities, including tasting of their produce.

For interesting pictures about growing methods to share with pupils, check out the videos and photos on:

www.growup.org.uk/growup-box

Vauxhall City Farm

165 Tyers Street, London SE11 5HS
020 7582 4204
www.vauxhallcityfarm.org

A little piece of the countryside in central London, this place has lots of educational experiences on offer. Established in 1976 this farm specialises in educational, theraputic and recreational services.

There are intriguing offers such as the Mobile Farm (so the animals can come to your school) and Incubation (so you can hatch chicks in your classroom).

www.vauxhallcityfarm.org/schools

More plant-centred pleasures include the Ecology Garden. There is also the possibility to Get Growing, whereby the farm staff can create a whole project with teachers to help a school set up its own food-growing space or wildlife haven.

GROWUP FARMS

VAUXHALL CITY FARM

LIGHT AND GROWING

EXPLORE

The King's Cross Skip Garden

Tapper Walk, King's Cross, N1C 4AQ
020 7790 8204
generate@globalgeneration.org.uk
The garden offers tours of their site, where a guide will explain how they grow the variety of crops and give you information about the materials used to build the garden. You might like to visit their skip garden café for lunch to try some of the garden's tasty produce.

The garden is open Tuesday – Saturday 10am – 4pm. You can contact them to arrange a visit via email.

www.kingscross.co.uk/skip-garden

LIGHT AND GROWING

CONNECT

Light and Dark in Growing – Two controlled experiments

Duration: 45 minutes introductory activity, 30 minutes follow up lessons

Setting the scene

Explain to pupils that they will be conducting two experiments to observe plant growth. They will monitor seeds and control the environments for their plants, in a similar way to the farmers in the Growing Underground company.

Ask pupils to consider which parts of a plant need light the most: seeds and roots or (green) stems and leaves? And which parts need to take in water?

Activity 1: Dark Germination

The purpose of this activity is to observe germination and measure the quantity of water required by dried seeds.

Dried Runner bean seeds are recommended. They are large enough to handle and often have striking pink/ purple/ black patterns so they are more interesting for observational drawings. Broad (Fava) bean or Butter bean seeds will also do, but they must start out dried. Results will be better if packets of seeds for gardening are used, rather than culinary seeds.

Do not allow pupils to weigh individual seeds. It is quicker and far more accurate to use a large number of seeds (say a total of 40 per class), weigh them altogether and then divide the result by the total number for the mean.

Electronic weighing scales are preferable. When the seeds are germinating in the tray, some air is needed. If the cupboard where they are kept is airtight, leave the door ajar.

Share Activity sheet 2: Dark germination (page 87) with the pupils. Run through the sheet together, and demonstrate how to measure the length, breadth and thickness of the seeds. Take measurements and record observations as detailed on the activity sheet.

Let pupils know that they will not each be allocated a particular seed. It does not matter if a pupil draws and measures one seed for the first section and then a completely different seed for the second section etc. This is because all the data will be pooled for the whole class.

LIGHT AND GROWING

CONNECT

It is enough to know that when soaked, the seed sizes increase generally. But if you wish, all the dried seed lengths could be totalled and all the soaked seed lengths could also be totalled. Then average seed length could be calculated and the average increase in size.

Extension

Average seed weight and water uptake per seedling can be calculated. Some of the seeds might turn out to be duds. If say three of them do not appear to have expanded much after the soaking, then those can be discarded – but remember to divide by the reduced number of (say) 37 when finding the new average weight. Likewise with the germination stage.

If pupils were running a business and wished to grow 10,000 seedlings, what volume of water would they need?

Activity 2: Grow into the Light

It would be nice if delicate plants grown in classroom environments had high survival rates. But failure is often caused by unsuitable room temperatures, fungus, inappropriate watering and pests. For expediency, it is recommended that ready – grown pots of herbs are used for this experiment. Basil plants can be cheaply purchased from supermarkets. These do not contain a single plant but many seedlings and they will do for this test.

Pupils should do a light survey of the classroom. Switch off any electric lights and use a light meter to determine light levels at different parts of the classroom, including inside a cupboard.

How different are the results with the electric lights back on?
Can results be displayed in a chart?

Will afternoon readings be different from those taken in the morning for the same places?

Set up the experiment by placing the four plants in different conditions:

- Plant A, by window in full sunlight
- Plant B, back of classroom away from windows
- Plant C in a dark cupboard
- Plant D, away from windows but illuminated by a bright lamp to one side

Share Activity sheet 3: Grow into the light (page 89) with pupils. Encourage pupils to make predictions about how well the four plants will grow. Pupils to inspect the plants every 2–3 days. Review their predictions at the end of the experiment.

THE SUN AND OUR SOLAR SYSTEM

CONNECT

Data logging opportunity

During the experiment, over a couple of weeks, readings for light levels and temperature can be logged if you have the equipment.

Quantity of water is an issue: the class needs to decide if all the plants should be watered with identical quantities. Or should they aim to keep all four pots at a similar moisture level? The plants in more shady conditions will need less water to maintain the same level of soil moisture, provided they are not right beside a radiator.

Whatever is decided, different groups of pupils can take turns to gather the data each day.

Results for Plant C might be surprising at first. When deprived of light, plants often become 'leggy' in an attempt to shoot up and 'find the light'. But in the end Plant C will be sickly-looking.

Stems of Plant B should be bending towards the window, whereas Plant A should be more upright if it is positioned in the best light.

Plant D may bend towards the window, but if the lamp light beside it is strong enough, stems may bend towards the lamp instead. Any other classroom lights should be switched off whenever possible (at lunchtimes and home-time) so that natural light conditions prevail.

FACT SHEET 1: GROWING IN LONDON

Growing a variety of plants in an urban city like London is often a challenge. We live in a densely populated city, so a lot of our land is used for housing. We don't have much space to use for agriculture in the city centre.

However, London is home to some very interesting and exciting examples of growing, using the small amount of land that is available. One of these is the 'Growing Underground' project which ingeniously uses old world war two air raid bunkers as a place to grow salad leaves and other edible plants.

Growing Underground

Growing Underground is situated 33 metres below the busy streets of Clapham in South London. Their crops include a wide variety of micro-greens and salad leaves, which can be grown all year round in the pesticide-free environment that the tunnels provide.

Can you think of any problems with growing crops underground?

Two vital ingredients are needed to grow plants – water and light. Since neither of those are present naturally in the underground tube tunnels, the farmers at Growing Underground had to think out of the box to make their plants grow.

GROWUP FARMS

FACT SHEET 1: GROWING IN LONDON

To provide enough water, they use hydroponic systems, which need 70% less water than traditional open-field farming. Since the farmers control exactly how much irrigation each plant gets, they don't waste any of this valuable resource.

Providing the plants with the best quality light was more tricky – it wasn't possible to capture the sun's rays and transfer them straight to the plants underground. The farmers had to build their own artificial light system in the tunnel and for that they used LED (Light Emitting Diode) technology. This allows the farmers to control the intensity of light that each plant gets.

The farmers can control everything that the plants are exposed to. They have adjusted the environment to produce what they think results in the tastiest crops. Their greens aren't affected by the weather or seasonal changes

King's Cross skip garden

This garden is in zone one, in an old bus depot, right next to King's Cross station. It is a charming oasis growing wild flowers, vegetables and herbs. Beehives, chicken coops and yurts are dotted about in the space.

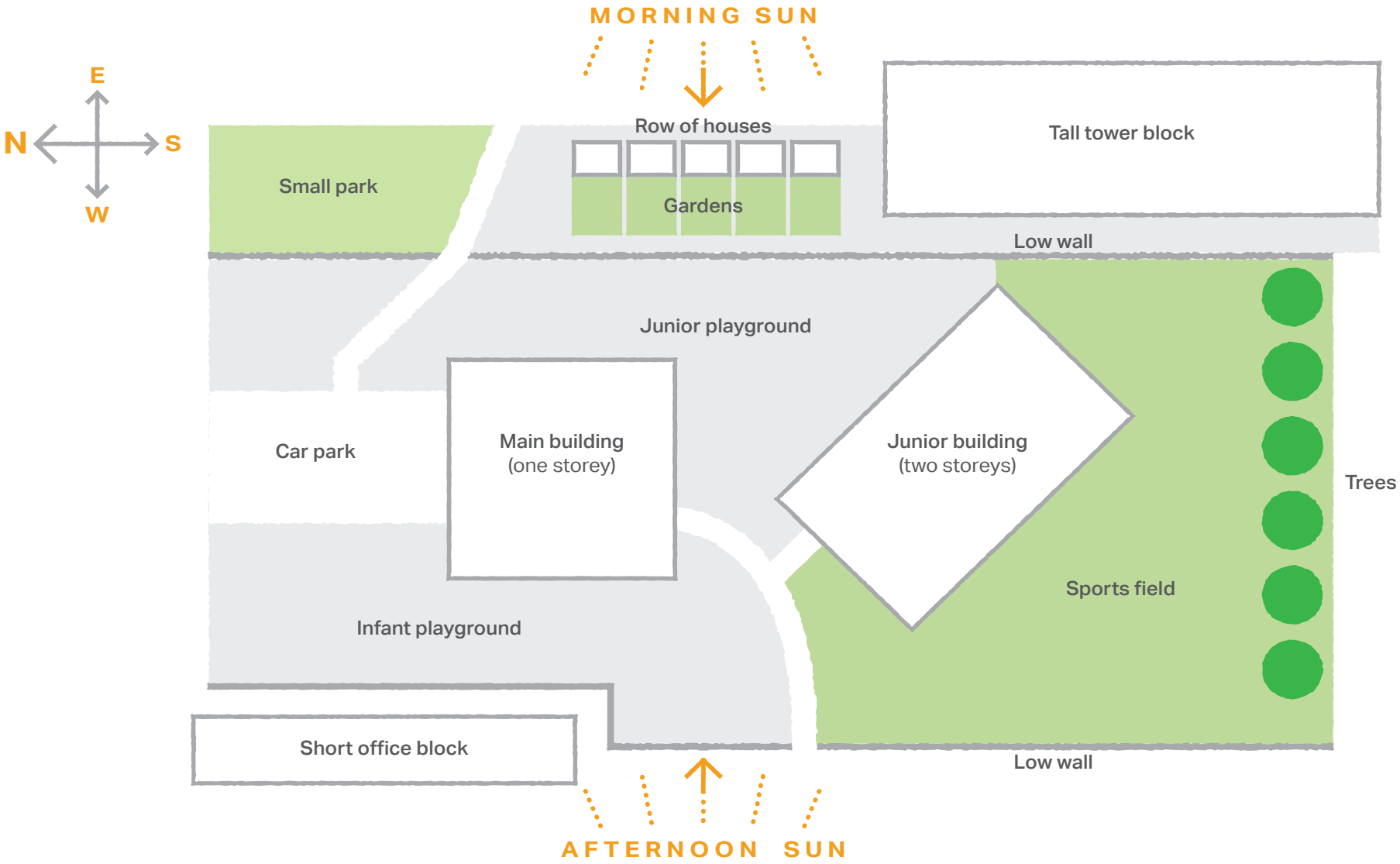
Everything has been built from upcycled materials, which were mostly found in the building site when King's cross station was being redeveloped. Lots of local young people (named 'Generators') were involved in creating the garden and many still help with maintaining the garden today. Some even work in the on-site café, turning their lovingly grown crops into delicious lunches. As well as growing food, tending beehives, creating furniture and making jams, the Generators learn how to market and sell their produce.

The skip garden is open to the elements, so the amount of light and water that the plants get cannot be controlled in the same way as in the 'Growing Underground' project.

www.globalgeneration.org.uk/about-the-skip-garden

KING'S CROSS SKIP GARDEN

ACTIVITY SHEET 1: MAP OF LUMIERE PRIMARY SCHOOL



ACTIVITY SHEET 2: DARK GERMINATION

Seeds may be small but they are amazing.

Inside each seed is a tiny new plant, along with its own food supply to get it started. It is as though the tiny plant has its packed lunch in with it!

But the food is often dry. This means that the seed can last for months without going rotten. So before the tiny plant can use its food and start to grow, that food must be hydrated.

Question:
Remember one gramme of water is one millilitre of water. How could you work out the volume of water taken up by all the germinating seeds?

Stage 1

Date:

Observational drawing of a dry seed

Measurements of dry seed

Length: Breadth: Thickness:

Estimated total weight of all seeds:

Actual total weight of all seeds:

ACTIVITY SHEET 2: DARK GERMINATION

Stage 2 instructions

Put all the seeds in a jug of water to soak, in a cupboard. One to two days is plenty, if they are at room temperature. Afterwards, take them out of the jug of water and gently pat them dry with a paper towel before the next stage.

Stage 3 instructions

Place each soaked seed on its side, on top of several layers of very wet paper towel in a large tray. Then put them all back in the cupboard. After a few days, place each seedling on a dry paper towel for drawing. Then hand it in for weighing altogether with the other seedlings.

Stage 2

Date:

Observational drawing of a soaked seed

Measurements of dry seed

Length: Breadth: Thickness:

Estimated total weight of soaked seeds:

Actual total weight of soaked seeds:

Stage 3

Date:

Observational drawing of a seedling

Measurements of seedling

Length (top of shoot to root):

Estimated total weight of all seedlings:

Actual total weight of all seedlings:

ACTIVITY SHEET 3: GROW INTO THE LIGHT

Different kinds of plants are adapted to live in different situations. Ferns grow well in shade and damp. Cactus plants can cope with harsh sunlight and dry conditions.

But whatever they are adapted for, if plants are placed in an unsuitable environment, they will not do well. Predict what might happen in these different situations below.

Label each pot A, B, C or D on one side only. The label stickers indicate the front of each pot.

Plant A – **By window in full sunlight** My prediction:	Plant B – **Back of classroom away from windows** My prediction:
Plant C – **In a dark cupboard** My prediction:	Plant D – **Away from windows but illuminated by a bright lamp to one side** My prediction:

ACTIVITY SHEET 3: GROW INTO THE LIGHT

Questions for class discussion:

1. If this experiment is to be a fair test, which of these factors must be kept the same for all four plants?

- Amount of light?
- Quantity of water given? Or moisture level of the soil?
- Temperature? If temperature drops at night-time, do all four plants get the same drop?

2. In your classroom, are there skylights in the ceiling? Are there electric lights which are switched on all day?

   If so, plants B and D should have something placed above them to shade them from the overhead light.

3. How will you record the progress of the different plants?

   Do the leaves seem to point in different directions on different plants?

   Daily photography might be quicker than lots of drawings. But whichever way, make sure the plants are put back the same way around as before, with their label A, B, C or D facing the front.

4. If some of the stems start to lean to one side, would it be possible to get them to grow straight up again?

LIGHT IN RELIGIOUS FESTIVALS

RELIGIOUS EDUCATION
(NON-STATUTORY)

Learning objectives

- Understand how religious festivals are related to key figures, events and stories and how these are celebrated within families and religious communities
- Appreciate places of religious importance, exploring through visits, their meaning and significance

ENGLISH

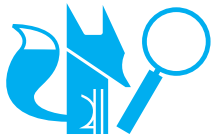
Learning objectives

- Develop positive attitudes to reading and understanding of what they read
- Recognise some different forms of poetry (for example, free verse, narrative poetry)
- Develop positive attitudes towards and stamina for writing by writing poetry

LIGHT IN RELIGIOUS FESTIVALS

LIGHT IN RELIGIOUS FESTIVALS

DISCOVER



Activity 1 Duration: 30 mins
Activity 1 Duration: 30 mins

Setting the scene

Explain that this topic will encourage pupils to explore the significance of light in a range of religious and cultural celebrations, and the ways in which they are celebrated around London. This first lesson will focus on Hanukkah, the festival of light in Judaism. Pupils will also study other religious/cultural festivals of light in the remainder of this topic.

Ask pupils if they know of any religious festivals of light, they might cite Diwali and Hannukah. Ask them if they know the reason why the festivals of light are celebrated, what are the stories behind them?

Activity 1: Hanukkah and the Little Jug of Oil

Begin this section of the lesson by discussing pupils' responses to light. Draw a light bulb or candle outline on the whiteboard and ask pupils to give you words or phrases to finish the sentence starting with 'light is…' Write these inside the outline.

Then sit pupils in a circle, light a large candle in the centre. Allow pupils time to reflect.

Surround the flame with words they have associated with light, then extinguish the flame and ask pupils to write what they now feel. Encourage pupils to think about sources of light and the feelings/emotions evoked, contrast them to those evoked with darkness.

Activity 2: Hanukkah and the Little Jug of Oil

Read the story in Fact sheet 2: Hanukkah and the Little Jug of Oil (page 98) to the whole class.

After reading the story, ask some comprehension questions to check that they understand the events in the story, and then some questions to encourage pupils to identify the significance of the story to those who practice Judaism.

Some questions could include:

- What is a Menorah?
- What happened when the Greek king poured oil into the Menorah?
- Who were the Maccabees?
- Who was the leader of the Maccabees?
- Why do you think the Menorah did not light for the Greek king?
- Why did it light for the Maccabees?
- Why do you think Jewish people celebrate this story with a festival?

LIGHT IN RELIGIOUS FESTIVALS

EXPLORE

The visit for this topic could focus on further exploring Hanukkah, or could explore a different religious, or cultural, festival of light that is celebrated in London.

Some suggestions for places to visit include:

- A synagogue to learn more about Hanukkah
- A mandir to learn about the Hindu festival of light, Diwali
- A church to learn about the Christian festival of Christmas

We recommend that you contact the place of worship directly to ask if they might be able to accommodate your school group. They might offer to give you a tour and/or a talk regarding the festival of light you're interested in.

If your teaching of this unit coincides with Diwali, you might like to visit the Diwali Festival on Trafalgar Square, held annually in October. No tickets are required so it is accessible to all.

Additionally, an 8-day celebration of Hanukkah takes place on Trafalgar Square every year in December. If your teaching of this unit coincides with this festival then you might like to use this as your explore visit.

Finally, if your teaching of this unit coincides with Christmas, you might like to explore your local high street, analysing the lights and their cultural/religious significance.

DIWALI ON TRAFALGAR SQUARE
© Urbanasian.com

HANUKKAH ON TRAFALGAR SQUARE
© Kois Miah

LIGHT IN RELIGIOUS FESTIVALS

CONNECT

Duration: 45 mins

Setting the scene

Introduce pupils to Activity sheet 1: Light poetry (pages101–103). Explain the mechanics of an acrostic poem to pupils: A poem that uses the letters of a word to begin each line vertically. Off of each vertical letter, another word or phrase is written that begins with the same letter.

Activity 1: Light Poetry

Invite suggestions for words that could be used in an acrostic poem, to describe the use of light in festivals that they will have studied in this unit. Encourage pupils to reflect on how these festivals are celebrated in their local communities/ across London as a whole. You might like to write these words on the whiteboard to scaffold pupils and complete either the 'light' or the 'darkness' acrostic poem as a whole class to support pupils before they write their own.

During independent working, you could ask pupils to complete an acrostic poem from Activity sheet 1: Light poetry (pages101–103) chosing from the words Light, Darkness, Candle, Flame, Diva or Menorah.

Encourage pupils to reflect on their learning from this unit when planning/ completing their poems. They will have studied different cultural and religious uses of light; they might like to focus on one of those uses in their poems, or a range of those uses. Also encourage pupils to reflect on the candle activity from the discover lesson: what did the light from the candle prompt them to think? How did they feel when the candle was extinguished?

You could ask pupils to accompany their poems with an illustration to represent the concepts explored in their poems.

You might like to create a 'Light Poetry' book from pupils' poems, to display in school and share with other classes.

FACT SHEET 1: FESTIVALS OF LIGHT

Many religious and cultural traditions use light in their celebrations. Light is very often an important symbol in festivals and ceremonial celebrations. In this topic, we'll explore the use of light in some traditional religious and cultural celebrations and the way in which people who live in London celebrate them.

First, we'll explore the Jewish festival of light, Hanukkah (you may prefer to use the word Chanukah). You'll then be given the opportunity to explore other religious or cultural uses of light.

Some examples of festivals involving light are listed below:

- Diwali, Hindu festival of light
- St Lucia's Day in Sweden
- St Martin's Day in the Netherlands
- O-bon the Japanese homage to ancestors in July
- Loi Krathong (loy-kruh-thong) festival in Thailand
- Kwansaa celebrated by African-Americans in the US
- Lantern Festival of Chinese New Year
- Pingxi Lantern Festival in Taiwan
- Festival of lights in Lyon
- Las Fellas, Fire festival in Spain
- East Pretoria festival of lights

CHINESE NEW YEAR LANTERNS

FACT SHEET 1: FESTIVALS OF LIGHT

KWANSAA IN THE USA
© AP PHOTO/FREE PRESS, ZACH FRAILEY

DIWALI
© WWW.MAAVAISHNAVI.COM

ST MARTIN'S DAY IN
THE NETHERLANDS
© Kitchenlioness

FACT SHEET 2: HANUKKAH AND THE LITTLE JUG OF OIL

Hanukkah, the festival of dedication, or the festival of lights, begins on the twenty fifth day of Kislev (November or December) in commemoration of the Maccabees' victory over the mighty Syrian and Greek armies of Antiochus Epiphanes. The armies intended to destroy the Jewish nation, its religion and its culture. The Jews succeeded in recapturing the capital city of Judea, Jerusalem and recapturing their Holy Temple in 165 B.C.

Hanukkah is celebrated by lighting candles each night of the Festival.

In the synagogue, prayers are offered during the festival and blessings and psalms are recited. At home, festival dishes are eaten, often pancakes.

The pupils play games with a Sevivon or Dreidel (Hanukkah spinning top), on the four sides of which are engraved the four letters: Nun, Gimmel, Hey and Shin, the first letters of: Ness Gadol Hayah Sham, meaning; "A great miracle happened there." In Israel the shin is replaced by Peh or Poh, meaning "here."

At schools and synagogues, plays and concerts take place during the Hanukkah week.

'The Little jug of Oil' story explains the events that led to the celebration of Hanukkah.

CANDLE OIL LAMPS

FACT SHEET 2: HANUKKAH AND THE LITTLE JUG OF OIL

THE LITTLE JUG OF OIL

Chapter 1

Many many centuries ago there stood a Menorah (lamp) in the holy temple in Jerusalem. It was made of pure gold and was called "the eternal light", because it was burning all day and night.

The Greeks arrived in Jerusalem and erected what many people thought to be an ugly statue in the Holy Temple. The Eternal Menorah saw the statue and vowed: "My pure sacred lights shall not illuminate this ugly idol!" The lights went out at once.

The Greek King was angered and shouted to his soldiers: "light it!" The soldiers obeyed, but the lights refused to burn. "Bring more oil!" the maddened Kind commanded. The frightened soldiers hastened to bring more oil. They poured it into the Menorah, tried to light it, but it still would not light.

The King wondered: "perhaps this oil is not pure enough! Go and find the choicest oil!" he ordered. The soldiers searched all over the city and brought the best oil they could obtain. The King himself poured the oil in the Menorah and tried to light it. The lights refused to burn.

"This Menorah requires some special oil!" the King decided, and ordered his soldiers to search the Temple for a special oil.

The King was right. There was a specially prepared oil in the Temple. It was made by the priests for the Eternal Menorah. Jugs filled with oil and sealed with the seal of the High priest stood in a separate room of the Holy Temple. The Greek soldiers found the jugs and brought them to the overjoyed King.

"Now," exclaimed the King, "we will light this stubborn Menorah in honour of our God!" He broke the seal of one of the jugs and a heavenly fragrance filled the room. He poured the oil into the Menorah, lit it, but the lights went out at once. The King tried another jug, a third, a fourth. He opened every jug, but the result was the same.

The king became furious. He dashed the golden Menorah to the floor and kicked the jugs with his feet. Then he stormed out of the temple, leaving the jugs overturned, their precious oil spilled on the floor.

Only one tiny jug filled with oil remained hidden in a corner, its seal untouched by Greek hands.

MENORAH
© S3.amazonaws.com

FACT SHEET 2: HANUKKAH AND THE LITTLE JUG OF OIL

Chapter 2

There was a silence in the holy temple. The Greek idol stood dumb and motionless. Only the overturned Menorah wept quietly and spilled oil bubbled on the floor. The tiny jug shivered in its corner and prayed: "I hope these brutes never come back!"

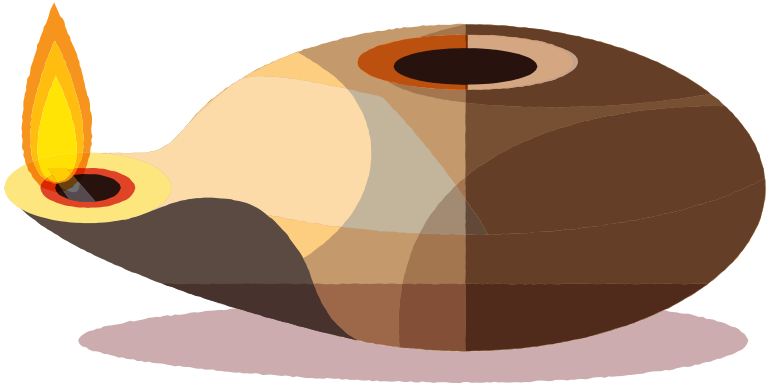
Many days and many nights passed. Then, one day voices were heard on the Mount of the Temple and steps came nearer and nearer to the entrance of the Holy House. The Menorah shuddered and the little jug shook with fear:

"They are coming back! They will spill my oil as they had done with the other jugs!" But its fear was in vain. These were not the voices and steps of the Greek soldiers. They were the voices and steps of the brave Maccabees and their heroic soldiers returning to the temple after their glorious victory over the mighty Greek army. They were coming back to clean the temple and to rededicate it to the service of God.

They entered the temple with songs of victory on their lips and flags of liberation in their hands. They smashed the statue of the Greek idol and threw it outside. They cleansed and polished the golden menorah until it glittered. They put it in its place and Judah Maccabee, the leader of the victorious army, went to light the Eternal light, but could not find any oil. He looked sadly at the overturned jugs and the pools of oil on the floor and wondered: "Where will we obtain oil to relight the Menorah?"

The little jug in the corner understood Judah's thoughts. It rolled from its corner and stopped at Judah's feet; he picked it up, broke its seal and looked inside. The tiny jug was full of oil, but Judah sighed: "One night. What will we do tomorrow and a day after tomorrow? It will take the priests at least a week to prepare pure oil!"

But then, a miracle happened. They poured the oil from the little jug into the Menorah day after day, and the jug was always full. It lasted for eight days until the new oil was ready to be used. During these eight days the people celebrated Hanukkah, the festival of Rededication, with lights in their homes, bonfires in the streets and songs of praise to God for the defeat of their enemies...



ACTIVITY SHEET 1: LIGHT POETRY

Title of poem: _____

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Title of poem: _____

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S

Name: _____ Date: _____

ACTIVITY SHEET 1: LIGHT POETRY

Title of poem: _____

F

L

A

M

E

Title of poem: _____

C

A

N

D

L

E

Name: _____ Date: _____

ACTIVITY SHEET 1: LIGHT POETRY

Title of poem: _____

D

I

V

A

Title of poem: _____

M

E

N

O

R

A

H

Name: _____ Date: _____

CREDITS

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