

Science through Story

Shine A Light



light source

bright

dim

light

dark

opaque

translucent

transparent

reflection

moon

sun

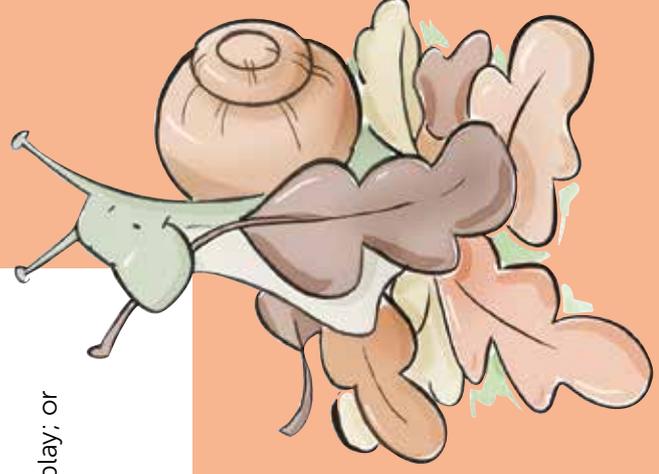
stars

Developing Children's Communication Skills through Science and Technology

In this resource pupils may be introduced to a range of new scientific vocabulary.

Pupils could:

- consider the words, and find definitions for them;
- draw pictures to illustrate the words;
- use the definition and illustrations to build a science vocabulary display; or
- use the vocabulary in their talking and in their writing.



Science Through Story



Opportunities to develop skills in Using Mathematics, Communication and Using ICT have been signposted throughout.

We Need Light to See

Learning Intentions

We are learning that:

- without light we cannot see; and
- we get light from sources other than the sun giving light to the earth.
- There are opportunities to develop whole curriculum skills throughout the activities. We have signposted links to the Cross-Curricular Skills.

Ideas for Learning

Talk about the part of the story where badger suggested a solution to the problem. Ask 'Why is it dark in the tunnel?' Children will probably say that it is because there is no sun to give light.

Explain that a light source is any object that produces light, including the sun, and ask the children to suggest what they might use as a light source if they were in the tunnel. Responses might include examples such as:

- a torch;
- a mobile phone; or
- a candle.

Ask the class to suggest ideas as to how they could create a dark tunnel. Make sure that you choose a location that allows the tunnel to stay up for a couple of weeks. Use a frame or a table and discuss what materials can be used to keep the light out. As you are assembling the area, encourage children to keep asking 'is there any light?' to ensure that the tunnel is in complete darkness. If you have enough space you could try building this outdoors, considering how to keep it waterproof as well as dark!

Test a range of objects by bringing them into the tunnel to find out if they produce light. Include light sources such as:

- a range of torches;
- a lamp;
- a mobile phone; or
- an iPad torch.

You can also use other objects which may be mistaken as light sources, such as:

- tin foil;
- mirrors;
- cellophane sheets;
- shiny card; or
- glitter.

If they **make** light, they are light sources. If they do not, then they are not light sources. Once the children have correctly identified light sources, ask them to choose various light sources and explore differences such as brighter/dimmer and lighter/darker. Test the light sources using a light sensor and data logger to find out which is the most effective.

Make a discovery box using a shoebox painted black and lined with black sugar paper. Cut out peepholes in one end of the box and pierce four small holes in the lid.

- Take turns at placing one of the soft toy creatures from the story sack into the shoebox. Estimate how much light, if any, they will need to see it.
- Initially cover the holes on the lid and look through the peepholes. Gradually uncover the holes on the lid to let in more light to illuminate the toy.
- Use a torch to increase the light even more. Look through the peepholes and discover what they can see when there is no light, some light, and so on.
- Use torches of different brightness and see if it makes a difference.





Light Travels

Learning Intentions

We are learning that:

- without light we cannot see;
- as well as the sun giving light to the earth, we get light from other sources;
- in dark dull conditions, we can see some colours more easily than others; and
- light passes through some materials easily, some less so, and others not at all.

Ideas for Learning

Ask the children if they have ever been outside at night when it is dark. Talk about what helps them to see at night. Responses should include sources of light from street lights, cars passing, and stars. Children may include the moon and clouds as sources of light. It is enough to explain that the moon is reflecting light from the sunlight and is not actually a source of light.

Watch videos on the internet to explain how the moon reflects light from the sun. Discuss the fact that the reason we see things is because the light travelling from the source bounces (or is reflected) off them, and then enters our eyes. If there is no light, then we can't see them.

Collect a range of objects that are shiny, dull or reflective. Give the children time to experiment with them in the tunnel by shining light sources on them and making observations.

Explain that if night time was truly dark we would not be able to see clouds either; however, they are thin enough to let the light through and that is why we can see them. Use the datalogger with a light sensor to investigate light travelling through a range of materials. You could include objects to investigate such as:

- rock
- ceramic cup
- glass
- cellophane wrap
- clear plastic lid
- mirror
- blackout lining
- tissue paper
- ice.

Place the object between the light source and the sensor to record how much light, if any, is passing through. Based on their findings, ask the children to sort the materials investigated into those which:

- let light through;
- let some light through; or
- let no light through.

Introduce the terms opaque, translucent and transparent. Allow the children to record their predictions and findings (see Resource 1).



Light Bends

Learning Intentions

We are learning that:

- light can be reflected off surfaces; and
- light bends as it travels from air to water.

Ideas for Learning

Create a light box to observe the movement of light (See Resource 2). Discuss observations of light bending (refraction) in different directions around the inside of the box once it hits the water. Explain that the water makes the light slow down and causes it to bend, just like water causes us to slow down (think about trying to run in a swimming pool).

Set up a prism corner. Display a range of prisms and various materials, for example patterned paper, plain paper, or colouring pencils/pens for the pupils to explore. Encourage children to explore the prisms by looking through them by a window or by taking them outdoors! Ask the children to draw the rainbows created by the prisms with coloured pencils/pens. Invite the children to look at things through the prisms, for example, patterned paper.

Discuss the fact that light from the sun is made up of many colours but as it passes from the air to the prism it bends (refraction) and splits up into the combination of colour that it is made from. Invite the children to think about what the colours remind them of. If they suggest rainbows, ask them if they have ever seen a rainbow. Encourage them to think about when they have seen a rainbow (a rainy day) and make suggestions for how the colours of the rainbow have been made by the light of the sun. (Sunlight is reflected and refracted from different raindrops). Set up a model to explore how rainbows are formed (see Resource 3).



Night Vision

Learning Intentions

We are learning that:

- animals use their senses for survival; and
- animals have characteristics which are adapted to their environment.

Refer to some of the animals' ideas about solutions to the problem in the story. Ask the children to think about why the tunnel that Badger has suggested might not be a good solution for all the animals. As they take time to talk about their ideas, encourage their thinking by asking 'why do you think that?' If you need to, direct the discussion to make sure that they remember that badgers are nocturnal animals and as such, have heightened senses (particularly touch and smell) to help them survive in the dark.

Ask the children about what they know about badgers. Display images of badgers or share footage from the internet, search for 'Badger watching in the forest' which you can find at www.bbc.co.uk/education

Ask the children to observe closely and to make a record in a fact file. Encourage them to consider what other questions they still have about badgers, for example:



- What do badgers like to eat?
- Where do badgers live?
- Are badgers friendly?
- How do badgers see in the dark?
- Do badgers have predators?
- Are badgers at risk? Is it important to protect badgers?

Give the children time to carry out research using books and the internet. You may choose to model the process of researching one or two questions and then allow children to develop their own notetaking skills by recording their findings to a number of their questions. Give the children the opportunity to develop their skills in report writing.

Create a presentation of their report using software tools or iPad apps such as Keynote, Haiku Deck or Tellagami EDU.



Alternatively consider using Scratch or BlackCat Logo to create a network of tunnels in a badger's den and programme the badger as it journeys through.



Ask the pupils the question 'Are humans naturally adapted for night life?'

Use a thinking diagram (see Resource 4) to compare and contrast humans with nocturnal animals. Talk about how technology and artificial lighting allow us to be able to live a nocturnal life even though we are naturally diurnal.



Resources

Fair Testing

Does Light Travel through Materials?

| Material | My prediction | Test result | Comments |
|----------|---------------|-------------|----------|
| A | | | |
| B | | | |
| C | | | |
| D | | | |



Safety Note: Always carry out a risk assessment and follow the school policy on health and safety.

Resource 2

Exploring

How Does Light Move?

Equipment

- large cardboard box with lid
- paint and paintbrushes
- three plastic bottles
- aluminium foil
- food colouring
- glitter
- light source, such as a torch.

Method

1. Paint the inside of the cardboard box with black paint and line with black sugar paper to ensure it is completely dark.
2. Cover the lid of the box with aluminium foil.
3. Fill the plastic bottles with water.
4. Add a few drops of food colouring to one bottle and some glitter to another bottle.
5. Secure the lids tightly on the bottles. Consider taping them up for added security.
6. Trace the bottom of the bottle on paper and cut out. Use this as a guide to cut a hole on the top of the box. Observe one bottle at a time, by pushing it into the hole so that it is half outside the box and half inside the box.
7. Shine a light source on the bottles from outside the box. Make observations through the peepholes and discuss.



Safety Note: Always carry out a risk assessment and follow the school policy on health and safety.

Formulating Models

Why Do Rainbows Appear?

Equipment

- glass bowl
- water
- plastic mirror
- torch
- sheet of white paper.

Method

1. Pour water into the glass bowl until it is about half full.
2. Place a mirror halfway under the water, resting at an angle on the edge of the bowl.
3. Use a torch to shine light on the mirror.
4. Hold the sheet of white paper directly above the mirror.
5. Adjust the tilt of the mirror until the colours of the rainbow appear on the white sheet of paper. Note: the darker the room, the more effective the rainbow will be.



Safety Note: Always carry out a risk assessment and follow the school policy on health and safety.

Exploring

Compare and Contrast. Are Humans Naturally Adapted for Night Life?

Humans

Nocturnal Animals



Similarities

| |
|---|
| • |
| • |
| • |
| • |
| • |

Humans

Nocturnal Animals



Differences with regard to

| | | |
|--|------|--|
| | eyes | |
|--|------|--|

| | | |
|--|------|--|
| | ears | |
|--|------|--|

| | | |
|--|------|--|
| | nose | |
|--|------|--|

