Where is the shadow?
Light

29

time
70 minutes

learning outcomes
To:
- discover that light travels in a straight line; obstacles placed in the way of the light cause it to change direction
- know how a shadow is formed
- discover that the position of the shadow changes if the position of the light source changes
- discover that the length of the shadow changes if the position of the light source changes
- know that the shadow on Earth changes because the Earth moves

end product
- drawings of shadows in the playground

materials needed
- 12 pavement chalks
- 12 torches
- 12 square blocks
- vacuum cleaner hose
- ball
- sticker

Tip. For the activity **Drawing shadows** the sun needs to be shining.

Preparation
For the activity **Light travels in a straight line** you will need a vacuum cleaner hose and a torch.

Light travels in a straight line 15 min.
Take the torch and the vacuum cleaner hose. Ask one of the children to hold the end of the hose so that the hose forms a straight line. Shine the torch through the hose. Ask the children to raise their hands if they think they would be able to see the light if they looked through the other end of the hose. Encourage some children to look through the end of the hose. Can they see the light?
Now ask the child who is holding the hose to bend it a little. Shine the torch through the other end of the hose. Ask the children again to raise their hands if they still think they will be able to see the light if they look through the other end of the hose. Encourage some children to look through the end of the hose. Can they see light this time? The children then complete Task 1 on the worksheet.

Ask the children why it is that they can see the light when the vacuum cleaner hose is straight but not when it is bent. Explain that light always travels in a straight line.
That is why you cannot see the beam of light when the hose is bent.
Explain that when beams of light meet an object or a person, a shadow is formed. This is because the object or person gets in the way of the light. The light cannot pass through. Behind the object or the person there is no direct light, so you see a shadow.

Tip. Perform this activity early in the morning and late in the afternoon so you can see a clear difference in the shadows.

The children investigate what a shadow is, how it is formed, and whether a shadow changes during the day.

Drawing shadows 15 min.

Then take the children outside to the playground. Organise the children into pairs. Give each pair a stick of pavement chalk and explain that one child will draw and the other needs to stand still. Ask all the children who will be standing still to face in the same direction. The other children use the pavement chalk to draw around the shadows of their classmates. They should also draw around the feet of the children who are standing still. This will help them to remember where they were standing when they come back in a couple of hours. Draw the children's attention to the direction of the sunlight. Does this match the position of the shadow?

Shadow in the classroom 15 min.

Return to the classroom with the children and ask this question: 'What made your shadow?' The rays of light from the Sun were blocked by the children's bodies. So there was no direct sunlight behind the children. You could see a dark shadow. Explain that you cannot have a shadow without a source of light. Encourage the children to name some sources of light. Discuss briefly the difference between natural light sources (such as the Sun) and artificial light sources (such as electric lights).
Explain that they are now going to look at how the shadow of the block changes if you shine a torch on it from different directions. Give each pair a torch and a block. Ask one child from each pair to shine the torch on the block. Give the children a few minutes to observe what happens to the shadow if you shine the torch at the block from different directions, from directly above, diagonally etc.
Hand out the worksheets to the pairs of children. The drawing in Task 2 shows three ways of shining the torch on the block. Encourage the children to do this and draw the shadow that is formed each time.

When everyone is finished, discuss the completed worksheets. Ask questions such as: Does the shadow change its position if you shine the light from a different direction? Does the shadow get longer or shorter if you shine the light from a different direction?

Has the shadow changed? 10 minutes

Ask the children if they think the Sun has changed position while they have been indoors. Will the shadow be the same? Write their predictions on the board.
After sufficient time has elapsed between activities, return to the playground with the children in pairs. One child stands in the same position as before whilst the other draws with chalk around the shadow. Ask this question: 'Is the new shadow different? Is it longer or shorter than the first time? Is it in the same place?'

The Earth moves! 15 minutes

The children complete Task 3 on the worksheet in the classroom. Discuss the differences between the children's shadows. Was this what they expected? Ask why it is that the shadows have changed.
What happened to the Sun?
Explain that the Earth rotates on its axis. This is why you see the Sun in a different position each time in the playground. Demonstrate this using a ball (the Earth) and a torch (the Sun). Mark the ball with a sticker and say that this represents the place where they live. Turn the ball slowly round while shining the torch on it from the same direction. Show the children that the sticker constantly changes position relative to the Sun. This is why you see the Sun in a different position each time. Because the light always travels in a straight line and the Sun shines from a different position, the shadows look different every time, just as they discovered with the block.

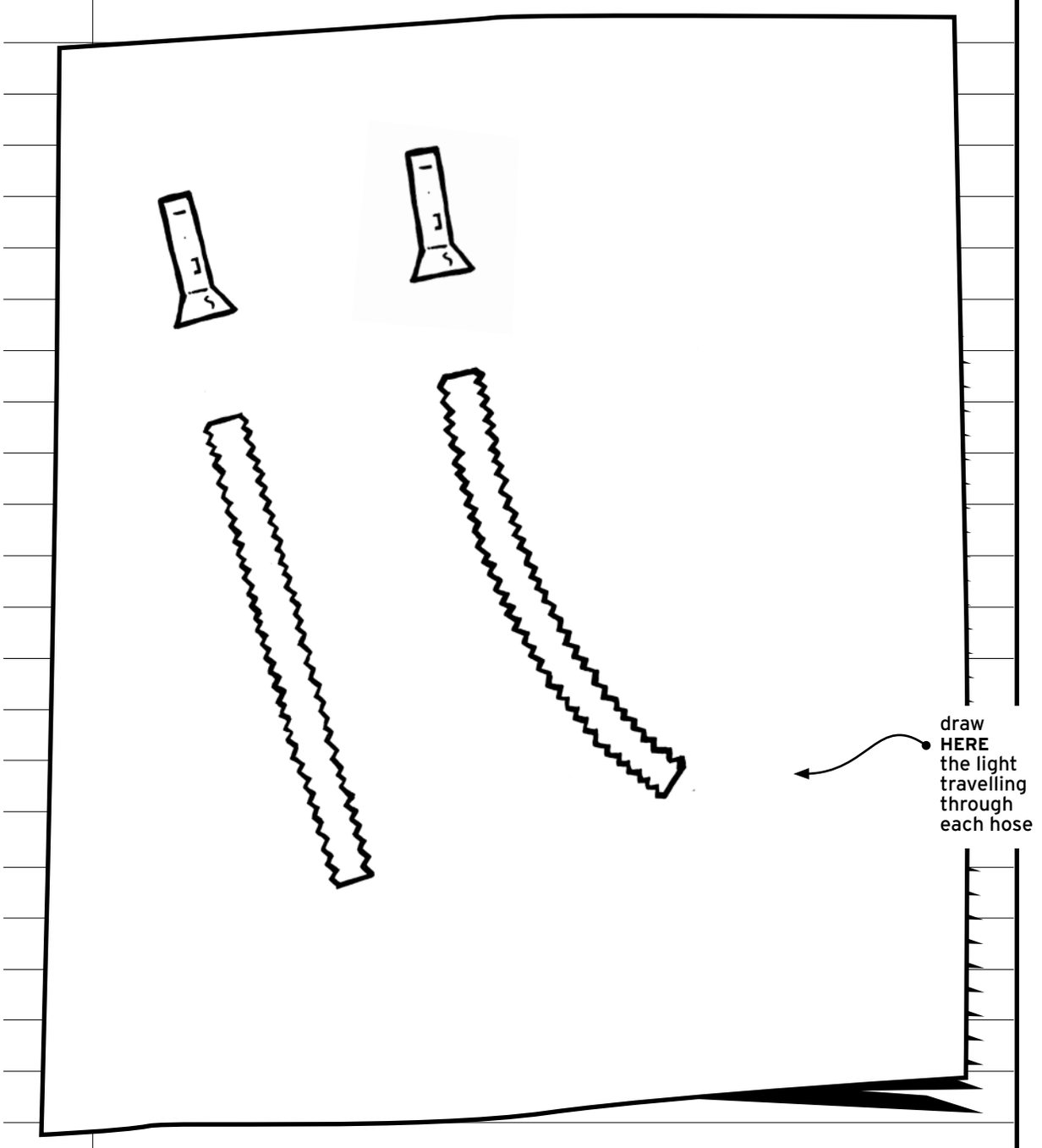
Where is the shadow?

1 Light travels in a straight line

Here you can see two vacuum cleaner hoses.

How does the light travel through them?

Draw this!



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2 Shadow in the classroom

What do you need?

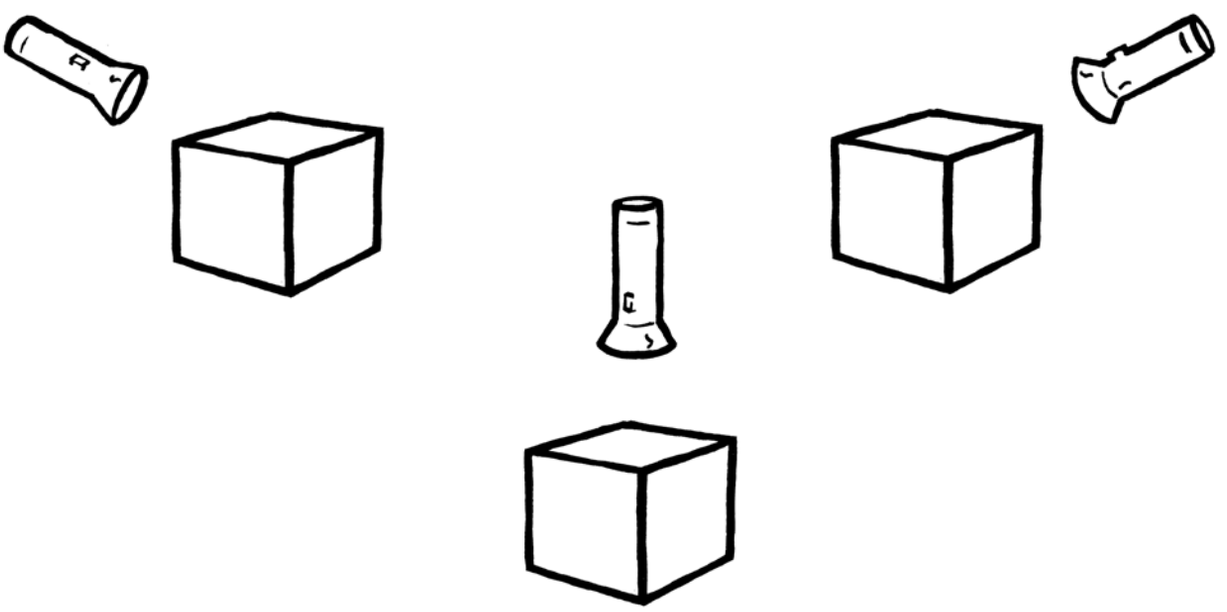
- torch
- pencil

What are you going to do?

1 Look at the drawings.

2 Hold your torch as shown in the drawing.

3 Draw the shadows you can see.



3 The Earth moves!

CIRCLE the correct answer

Circle the correct answer.

Did the shadow this morning look different from the shadow this afternoon?

yes / no

Is the second shadow longer than the first? **yes / no**

Is the second shadow in a different position from the first? **yes / no**