Learning Activity

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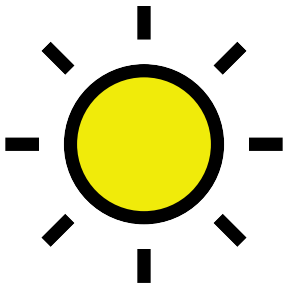
Science and Technology
Grades 5 and 6

Spotlight on Diagrams

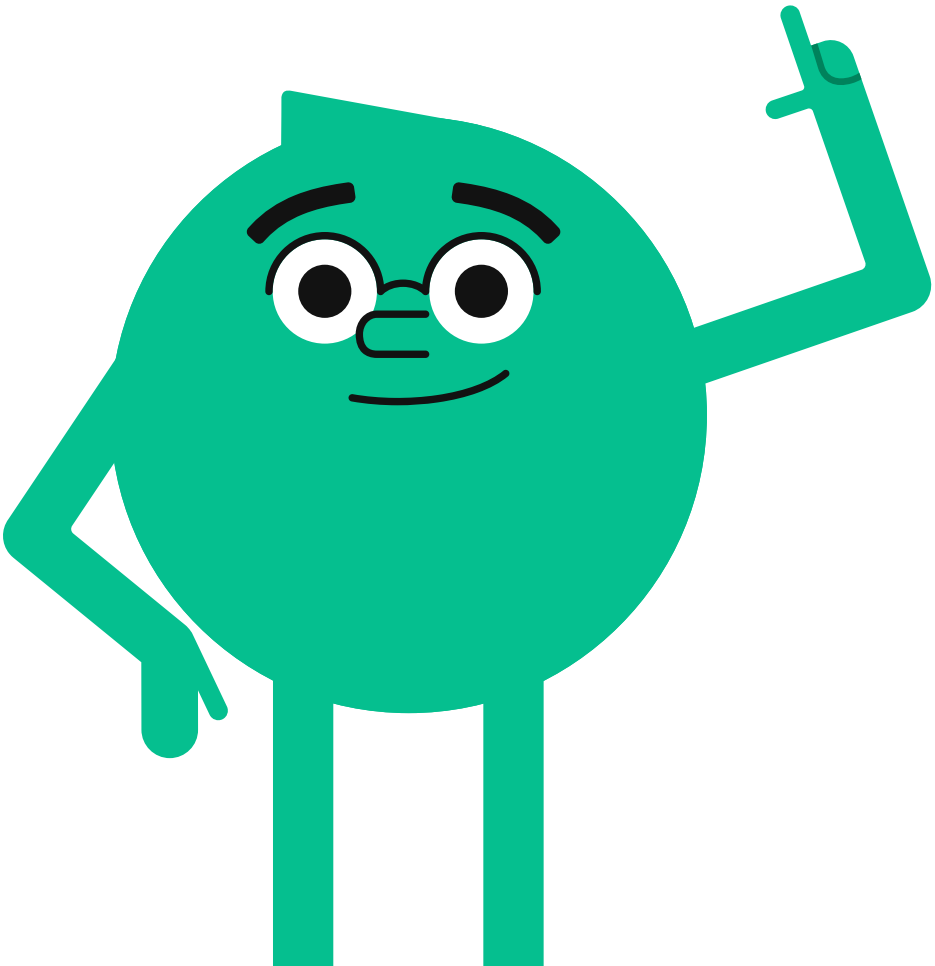


Teacher's Guide

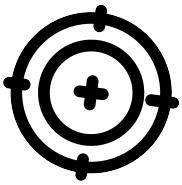
Overview

The behaviour of light can seem complex and abstract, but a diagram can make it much clearer.

The *Spotlight on Diagrams* activity has elementary Cycle 3 students represent the refraction of light in a diagram. They will learn what a diagram is and how to create one.



Objective



Use a diagram to represent a scientific phenomenon

Duration

50 minutes

Materials

- 1 copy of the Teacher's Guide
- 1 copy of the Student Booklet for each student

For the demonstration:

- 1 loonie or toonie
- 1 piece of clear tape
- 1 small opaque bowl (e.g., a small ceramic serving bowl)
- Water

Procedure

Introduction (5 minutes)

Present the *Eyes and Light* section.

Demonstration (10 minutes)

1. Tape the coin to the bottom of the bowl.
2. Have the students gather around you. Here are some questions you can ask them.

Question	Expected Response
What is the source of light that is illuminating the coin?	*The overhead light in the classroom, sunlight coming through the window, etc.*
Is the light reflected by the coin reaching your eyes?	*Yes, because I can see the coin. That means the light is reaching my eyes.* **Note**: All the students must be able to see the coin for this part. If they can't, they need to get closer.

3. Ask the students to take a step back. They must be just far enough away that they can no longer see the coin. Here are some questions you can ask them.

Question	Expected Response
Is the light reflected by the coin reaching your eyes?	*No* **Note**: For this part, the students must not be able to see the coin.
Is there anything blocking the light from reaching your eyes?	*Yes, the bowl is preventing me from seeing the coin.* *Yes, because the bowl is opaque.*
Do you think you would be able to see the coin if the bowl were transparent?	*Yes, if the bowl were transparent, the light reflected by the coin would reach my eyes and I would be able to see the coin.*

4. Pour the water gently into the bowl. The students will see the coin appear.

Why this experiment works

Light travels more slowly in water than in air. So, when light passes from water to air, it bends. This phenomenon is called *the refraction of light*.

When there was no water in the bowl, the light reflected by the coin did not reach your eyes. Adding water to the bowl caused the light to bend toward your eyes, which is why you could see the coin.

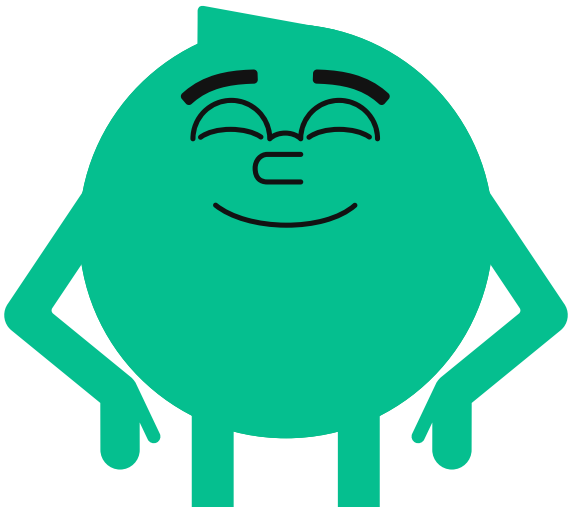
Refraction is also why objects look distorted when they're placed in a glass of water or viewed through a magnifying glass.

Here are two images you can present to your students.

The pencil looks broken at the surface of the water.
Source: Shutterstock

The girl's eye appears larger through the magnifying glass.
Source: Shutterstock

5. Have the students describe what they've observed in their Student Booklet.



Creating diagrams (30 minutes)

- Present the *What is a Diagram?* section.
- Have the students draw their own diagram in their Student Booklet.

The students can use diagrams 1 and 2 in the Student Booklet for inspiration. Encourage them to share their work with classmates and give each other feedback. Ask them to explain what they've drawn. Gently question their choices for parts of their diagram and guide them toward possible improvements.

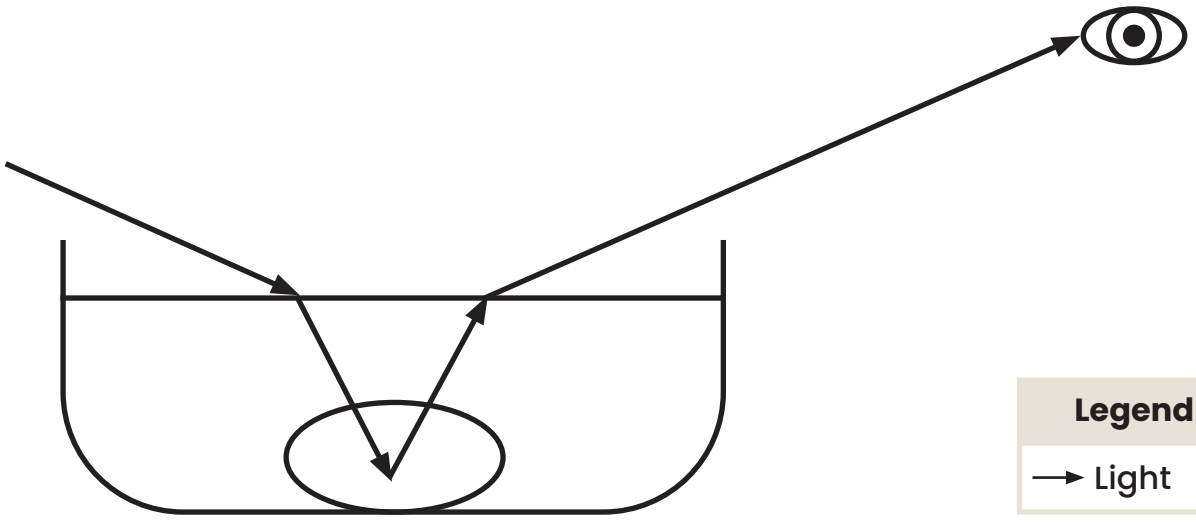
For example, if a student shows the bending of light with a curved arrow, you can help them understand that light travels in straight lines and doesn't curve around objects.

Source: Shutterstock

The formation of shadows is proof that light travels in a straight line.

Here's an example of a diagram you can use to guide your students. However, we recommend not using it as a model answer.

Diagram 3. The coin becomes visible when water is added



In this diagram, we can see that light is refracted twice: when it enters the water and when it leaves the water. We can also see that the light coming out of the water reaches an eye (representing the observer).

Conclusion (5 minutes)

You can wrap up the activity by explaining that diagrams are powerful tools for scientists. They help to:

- simplify complex phenomena
- communicate ideas and information
- represent problems and find potential solutions

Go One Step Further

- Ask the students to give examples of diagrams they've seen recently, whether in science or another subject (e.g., the seasons cycle, the different parts of a plant).
- If you have enough materials, students can do the demonstration in pairs. Each pair will do the demonstration twice so each student can see the coin appear while the other pours water into the bowl.
- Discuss natural phenomena caused by refraction: e.g., rainbows, mirages.
- Give examples of how refraction is used in everyday life: e.g., glasses, microscopes, telescopes, cameras, magic tricks.

Have you done our activity with your class? We'd love to hear your comments and suggestions.