

THE VISIBILITY OF LIGHT (1 HOUR)



Addresses NGSS

Level of Difficulty: 1

Grade Range: K-2

OVERVIEW

In this activity, students will learn about the nature of light, make predictions about and assess its ability to pass through various substances. Students will learn that the material of the object in the light's path will determine the light's ability to pass through it.

Topic: Light

Real-World Science Topics

- An evaluation of the function and purpose of light and its ability to reflect through certain substances
- A comparison of the translucency of certain substances and how each material determines light's ability to pass through it
- An examination of the distance that light can travel and how light can be redirected from a mirror onto another substance

Objective

After completing this activity, students should be able to explain light's ability to travel at varying distances. They will be able to discuss the fact that light's ability to pass through an object depends on the material of that object. Lastly, they should be able to describe how shining a light on a mirror can affect the direction of the light.

NGSS Three-Dimensions

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Planning and Carrying Out Investigations</p> <ul style="list-style-type: none">• Plan and conduct investigations collaboratively to produce evidence to answer a question. <p>Scientific Investigations Use a Variety of Methods</p> <ul style="list-style-type: none">• Scientist use different ways to study the world.	<p>PS4.B: Electromagnetic Radiation</p> <ul style="list-style-type: none">• Objects can be seen if light is available to illuminate them or if they give off their own light.• Some materials allow light to pass through them, others allow only some light through and others block all light and create a dark shadow on any surface beyond them where light cannot reach. Mirrors can be used to redirect a light beam.	<p>Cause and Effect</p> <ul style="list-style-type: none">• Simple tests can be designed to gather evidence to support or refute student ideas about causes. <p>Influence of Engineering, Technology, and Science, on Society and Natural World</p> <ul style="list-style-type: none">• People depend on various technologies in their lives; human life would be very different without technology.

Background Information

What is light?

In physics, light is actually electromagnetic radiation of a wavelength. The light is the visible spectrum that the human eye can see.

What are the characteristics which cause light to be able to pass through certain objects, but unable to pass through others?

When light goes through a translucent/transparent substance, it is able to maintain its same wavelength, thereby maintaining visibility. When it passes through an opaque substance, its wavelength stops and visibility ends. According to the Law of Reflection, when a ray of light hits a surface, it bounces off like a tennis ball hitting a wall. When light encounters a change in medium other than the one it was traveling through, it can change direction at the point called the interface. This change comes from a change in velocity as well as wavelength.

What happens when a beam of light is shone on a mirror? What are the characteristics of the mirror which enable light to redirect itself?

When light is projected against the flat surface of a mirror, the light reflects without disturbing the image.

Key Vocabulary

Light – electromagnetic radiation of a wavelength seen by the human eye

Spectrum – range of all possible frequencies of electromagnetic radiation

Reflection – change in direction of a wave at the interface of two different mediums

Translucent – able to allow light to pass through

Materials Needed for Activity

- A minimum of two flashlights, or up to a class set if possible
- A large blanket or comforter
- Hand held Mirrors
- Black bulletin board paper
- White bulletin board paper
- Pillow case
- Large sheet of cardboard
- Wax paper
- Clear sheets of plastic (you can cut large, plastic zipper bags on the seam line)
- Towels
- Paper towels
- Poster board
- Handouts
- A chart paper with the same chart as depicted on the handout

Teacher Preparation

- Create the same chart paper as the one on the handout.
- Have all materials ready to use.

1. **Warm-up Activity:** Hold up a flashlight. Ask students the following questions:
 - “What will happen if I turn on this object?”
 - “How far do you think the light will project?”
 - “Will the beam of light coming from here be able to project to that wall?”
 - “Will it project to the wall in the hallway?” (or to a location outside of their classroom wall)
 - “How is it that this light can be seen across the room?”

Now, ask for two students to come up and hold the comforter/blanket. Stand behind the blanket. Ask the class what they think will happen now if you shine the flashlight onto the blanket. Will it be seen on the other side? Take predictions and ask students why they have certain ideas. Shine the flashlight on the blanket. What happened? Why? Discuss with the students. Explain to them the concept of light and how it works and how light travels through substances at times depending upon the translucency of the substance.

2. Tell the students that they are going to test several substances made of different materials to find out if light will pass through each of them. Now, pass out the handouts to the students. Read the instructions and explain to students that they are going to see several items and make predictions about whether or not the beam from the flashlight will pass through them. They will check off “yes” or “no” to indicate their predictions.
3. Begin holding up each item listed on the handout one at a time. Call two students up to hold up the larger items. As you hold up each item, ask the students to think about what the item is made of and if it is translucent or not. Have them check off their prediction as each item is brought up and discussed.
4. Now, have the students find out if their predictions were correct. Continue assessing each item by calling a student or two (for larger items) to the front of the room. Have the student(s) hold up the item. Call an additional student to hold the flashlight. Discuss the findings of each item. Ask students to share if their predictions were correct as you assess each one. Discuss the material of each why light was able/unable to pass through each.

Have students complete their chart as you review each item.

Second grade- Instead of examining each item as a class, have the students divide up into four groups. Then, divide the objects evenly among the groups. Or, if you have enough of the items, each group can assess each item and discuss as teams.

5. Next, tell the students they are going to learn a new concept about light called *redirection*. Select two students to come up to the front of the room again. Select one of the items that was able to pass light through and have students hold up the item. Hold up the mirror and ask the students to make a prediction about how the mirror can be used in the activity. Ask them to explain what might happen if they hold the mirror up to the light that is passing through. Hold up the mirror in the direct path of the light. Observe what happens. Talk to your students about why the light could be redirected.

First and Second Grade

Have students think about what they learned today and complete the handout. First, do a “think, pair, share” with the students. This involves having the students think individually of a specific concept for a few moments. Second, they pair with a partner to share their ideas. Finally, they share out loud with the class what they discussed. Then, students can write their final conclusions on their worksheets.

Extension Activity

Conduct the activity described above, but use flashlights of varying sizes to include very small flashlights, small, medium, and large. If you have a laser pointer or cell phone light, add these to the group of flashlights. Compare the ability of the sizes of the light beam and their ability to pass through objects of varying materials. Have students make predictions again. Use student size objects such as construction paper, clipboards, dry erase boards, textbooks, small Ziploc baggies, lunch bags, etc. Also, have the students select one or two objects individually to add to their assessment. Students can bring in one object from home to assess.

Sources

<http://www.sciencekids.co.nz/sciencefacts/light.html>

<http://www.optics4kids.org/home/teachersparents/articles/the-refraction-of-light/>

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STUDENT HANDOUT



Name:

Date:

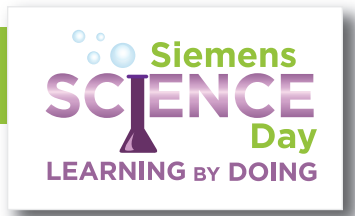
The Visibility of Light

Use what you know about each item below. Make a prediction of whether or not light can pass through each object. Write yes or no to indicate your prediction. Then, after you or your group tests each item, check your prediction. Write a 😊 in the space, if you are correct, or a ☹️ if you were incorrect. Then, answer the questions below.

Item	Prediction Write yes or no.	Check your prediction.	

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STUDENT HANDOUT



How many items were you able to predict correctly? _____

How many items were you incorrect about? _____

Were you surprised about any items? Why? _____

(First and Second Grade)

What did you learn about light and its ability to pass through objects? _____

(For Second Grade)

What questions did this activity make you think about? What new ideas do you have about light?
