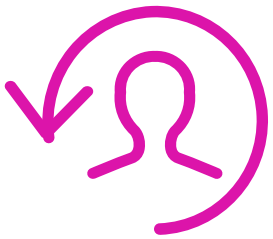
3M Young Scientist Lab

Family Activity | Grades 6–8

Right Back at You!



OVERVIEW

How well light is reflected is important for safety. Reflectivity makes signs more visible and bicycles and walking clothes safer for their users, especially at night. During our lesson, young scientists made a rudimentary light reflectivity tester to help them determine the relative reflectivity of various materials around the classroom. They determined what the qualities were that made surfaces more or less reflective. They are encouraged to learn about retro-reflectors and how they are incorporated into 3M safety products. At home, students can continue to investigate reflectivity with their families using some simple activities.

OBJECTIVES

Students will be able to:

- make and use a reflectivity tester.
- identify properties of materials that make them more or less reflective.
- understand and explain how a retro-reflector increases reflectivity.

BACKGROUND INFORMATION

Light, as a form of energy, can be reflected from most surfaces to some degree. It is this property of reflection that actually allows us to "see" objects when light shines on them. When we look at and see a plant, for example, we are seeing light that has originated from a source and has then been reflected off the plant to our eyes. Different surfaces reflect light differently; some surfaces reflect light poorly (a dark sweater) while other surfaces reflect light very well (a mirror).

MATERIALS

- flashlight
- 3×5 index card
- scissors
- a device with access to the internet

HOME ACTIVITIES

1. Activity: With a flashlight (small LED flashlights work best), make a reflectivity tester as described by your young scientist. In addition to a flashlight, all you will need is an

index card and something to make a small hole in the index card. Let your student show you how it is used with various objects around the house.

2. Research Activity:
    - You and your young scientist could use the Internet to research 3M's line of reflective fabrics and products at this website: https://www.3m.com/3M/en_US/p/c/ppe/apparel/reflective-fabrics/i/safety/personal-safety/ that use reflective materials. Look around the house to see if you have any items that might make use of reflective material. Use your reflectivity tester to check them out. At night, how far away from these reflective materials can you get and still see reflected light? Does the angle between the light beam and your eye make any difference in the amount of reflected light you see?
    - Check this website to find an explanation of light reflecting straight back regardless of the orientation of the reflecting surface. https://www.3m.com/3M/en_US/scotchlite-reflective-material-us/industries-active-lifestyle/active-lifestyle/how-retroreflection-works/
    - Check this website to learn more about how 3M technology is used to provide visibility and reflective solutions for industry and active lifestyles. https://www.3m.com/3M/en_US/scotchlite-reflective-material-us/industries-active-lifestyle/

SCORING KEY FOR EVALUATE

1. A reflectivity tester works by shining a flashlight at a surface and seeing how much light gets reflected back up to an index card that is attached to the flashlight.

VOCABULARY

- **Relative reflectivity:** measuring reflectivity in a general sense to learn how the reflectivity of one surface compares with another, without actually capturing numeric data.
- **Reflectivity:** borrows light from another source and sends it back.
- **Retro-reflectivity:** light rays are returned in the direction from which they came.

THOUGHT/CONVERSATION STARTERS

Talk with your young scientist before you begin:

- Ask your student to share the results and findings of their work at school with the reflectivity tester.
- Ask your young scientist to explain how a reflectivity tester works.
- Ask your young scientist how reflectivity is used to solve problems? Share that the family can research together. If there are any problems in the neighborhood or around

the home that could be solved by what has been learned, encourage your young scientist to begin applying what was learned to solve the problem.

DOCUMENT THE LEARNING IDEA

- Allow your young scientist to document their learning at home by reflecting in their science journal. If a problem was identified in the home or community that could be solved using what was learned about reflectivity or retro-reflectivity, begin documenting the journey using the engineering design process in the student's science notebook.
- Take photos of the reflectivity tester in action using a smartphone or tablet. Use the photos to create a collage to demonstrate how it works or rank the reflectivity of the surfaces.
- Record a video to inform the class and share the differences between reflective surfaces in your home or community.

If your young scientist documents the learning, encourage them to bring their creations to class and share with the teacher.

CONTINUE MAKING CONNECTIONS

When you are out with your young scientist or plan a moment to specifically look around for reflective materials while driving or walking -- where are they? Are these reflective surfaces helping to solve a problem? How? Why? To take it further, do you notice reflective materials in other spaces?