Leader's Guide
Learning About Light, Second Edition

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Program Summary

Learning About Light introduces students to: what light is; how white light can be separated into a spectrum of colors; the terms 'transparent', 'opaque' and 'translucent'; reflection and refraction; and how the eye adjusts to different amounts of light.

Pre-screening Preparation*:

- Preview the program before screening it for the students; this allows you to establish any pause points for discussion
- A pre-screening activity has been included for students to prepare them, and give you an understanding of their prior knowledge in order to build upon it.
- The post-screening science activities further extend students' understanding.
- These activities could also be used as an assessment tool. Background information is also provided to assist with explanations if required.

**Note: Activities should be practiced prior to using with students*

Pre-screening Activity

What do your students already know about the subject of light? Determining students' current level of understanding will guide how you present the program and post-screening activities. Ask students to write down everything they know about light or any questions they may have. Have students work in teams to refine their lists; afterwards have the teams work in small groups to further refine their lists. The groups should then report back to you. You can use their data to create a class list of statements and questions regarding light. By discussing students' responses you can build on their existing conceptual ideas.

Post-screening Activities

Reflection

Materials
Flashlight
Mirrors
Small object to reflect (toy, block)
A protractor
Shiny objects; e.g. spoons, metal cylinders, metal lids

Activity 1-Using a number of shiny objects such as tin can lids, aluminum foil and different sized spoons, have students look at themselves with the objects and record their observations. Concave objects will result in the image looking bigger (and upside down). A convex surface will make the image look smaller.

Activity 2- Predict, Observe and Explain
Students are to predict how the flashlight beam will reflect on various surfaces. Students write down their observations and then attempt to explain why the flashlight beam reflected in the manner it did.
Darken the classroom and have students shine a flashlight beam at an angle on various surfaces. What surface reflected the best? What happens when you adjust the angle of the flashlight beam? Light will reflect off a surface at exactly the same angle as it hits the mirror.

Challenge the students to redirect light from one point of the room to another. Have the students devise challenges for each other.

Activity 3- Have student use mirrors to investigate how to make an object produce two images, three images and infinite images. Students report back on how they went about their investigation, whether they were successful or not with their solutions, and reasons for final outcomes. Record their results on the board or a wall chart.

Answer- By standing the mirrors next to each other and moving the outer edges slightly. Decreasing the angle between the mirrors increases the number of reflections.

- Mirrors held at 90 degrees give two images
- Mirrors held at 60 degrees give three images
- Parallel mirrors give infinite images

Refraction

Materials
Pencils, glasses, pitcher of water, an aquarium, flashlight
A number of aquariums would be ideal so students can experiment in small groups.

Activity 4
Predict, Observe and Explain
In a darkened room students are to predict what will happen when a light is shone into a half full aquarium at different angles. Students need to write down their observation as well as draw diagrams of the various angles of light shone into the aquarium. They then explain their observations (the terminology they use will be a guide to their overall understanding). Can they explain why the beam of light 'bends' when it hits the water? Do they understand that when the light passes through the water it slows down so we see the light as bending?

Activity 5
Extending the idea of the pencil in the glass of water as shown on the program, have students observe the pencil from different perspectives.
Place a pencil in a glass about ¾ full of water. Look at the pencil from different angles. Write down observations.

a) Hold a pencil straight in the glass. What does it look like from directly above? What does it look like from a side view?
   - Below water line slightly larger
   - Almost twice as large

b) Place the pencil on an angle. What does it look like from above and from an angle?
   - Little change
   - Magnified below water level, broken in two at water level

c) Students carefully place the glass above their head at arms length. What do they observe?
   - Surface acts as a mirror and pencil looks bent

An extension of this could be to have students sketch their observations.

Spectrum of Colors

Materials
Liquid for bubbles, straws, string
Prisms, flashlight or other light source (sunlight)
Card, rubber bands, coloring materials e.g. colored pencils, crayons and paint

Activity 6
Cut out a circle from white card 4 inches (10 cm) in diameter. Divide into quarters and color each of the segments in different colors.
Make two holes side by side in the center of the card, thread the rubber band through and tie it. Twist and spin the colored card.
Have students observe the colors. Can the students explain their observations? Discuss with students what has occurred.

Activity 7
Using prisms and natural light and/or light from a flashlight, break up the white light by having the light shine through the prisms. Discuss the spectrum of colors observed and relate back to the program.
Students can also use string threaded through straws to make large bubble-making devices. Dip into the bubble solution and make bubbles. Discuss why you can see different colors within the bubbles.

Background Information

Without light we could see nothing at all. The amount of light reflected from an object depends on the surface of the object. The amount of light absorbed is also dependent on the darkness/dullness of the surface. Light is reflected off a surface at exactly the same angle that it hits the mirror. Concave objects will result in the image looking bigger (and upside down). A convex surface will make the image look smaller.
Light travels fast and in a straight line. Light changes speed when it travels through different objects; it slows down and changes direction slightly and this is known as refraction.

Vocabulary
angle, concave, convex, magnified, opaque, reflection, refraction, spectrum, surface, translucent, transparent, white light

Refraction- Pencil in the Glass

Holding pencil straight

	Observations	Explanation
View from directly above		
Side view		

Holding pencil at an angle

	Observations	Explanation
View from directly above		
Side view		

	Observations	Explanation
Arms-length, above head, looking up		

Useful Websites/ Activities

http://www.proteacher.com/110017.shtml

http://homepages.wmich.edu/~b1klein/whatislight.htm

http://www.mste.uiuc.edu/courses/ci351fa02/students/mfdaniel/unit.doc

http://can-do.com/uci/ssi2003/light.html

http://www.uncwil.edu/nurc/acquarius/lessons/light.htm

http://www.uncwil.edu/nurc/aquarius/lessons/light2.htm

http://www.sasked.gov.sk.ca/docs.elemsci/gr4ufesc.html

http://www.phys.virginia.edu/classes/620/light_activities.html

Length
14 Minutes

Audience level
Grades 5 – 8

Subject Area
Science

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