ILLUMINATION FASCINATION

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PROGRAM SUMMARY

Students will enjoy dazzling displays of light and color using lenses, mirrors, and lasers in this interactive theater show!

CURRICULUM STANDARDS

This program is designed to address state and national science teaching standards. The following benchmarks of the Louisiana Science Framework are addressed in *See the Light*:

PS-E-C2	Investigating and describing how light travels and what happens when light strikes an object (reflection, refraction, and absorption).
PS-M-C3	Understanding that the sun is a major source of energy and that energy arrives at the Earth's surface as light with a range of wavelengths.
PS-M-C4	Observing and describing the interactions of light and matter (reflections, refraction, absorption, transmission, scattering)

BACKGROUND

Light is a combination of magnetic and electrical energy. It travels at extremely high speeds (light in a vacuum can travel at about 186,000 miles, or 300,000 kilometers per second) and the speed of light in a vacuum is constant (commonly termed "c").

While Light is composed of photons, which are small particles of energy. When light travels, it moves in small waves that progress as straight lines. It also has amplitude and velocity, which are wavelike characteristics. Because light has properties of both particles and waves, it cannot be easily classified as just one of the two.

Without light, color is not possible, and visible light is composed of different colors. Light and color go hand-in-hand, and different colors are produced by different wavelengths of light. The three primary colors of light—red, green, and blue. The three complementary light colors are yellow, magenta, and cyan.

When light rays bounce off an object, it is called reflection. Refraction is the bending of light waves due to a change in the medium through which the light passes. For example, when light rays pass through air into glass, the light wave's speed changes due to the change of medium, thus the light rays bend. Corrective lenses are examples or transparent substances that refract light.

EXHIBIT CONNECTIONS

You can focus your students' visit to Sci-Port by directing them to other programs and/or exhibits that relate to *See the Light*.

Exhibit	Location
Total Internal Reflection	Physical Sciences Gallery, 2nd floor
Spectrum	Physical Sciences Gallery, 2nd floor
Shadow Wall	Physical Sciences Gallery, 2nd floor

SITES WORTH SURFING

Sighting the First Sense
A wonderful Think Quest site with sections on the eye, perception, light and color
http://library.thinkquest.org/C001464/cgi-bin/main.cgi

About Rainbows
Everything you ever wanted to know about rainbows and how they're formed!
http://www.unidata.ucar.edu/staff/blynds/rnbw.html

Java Tutorials for Light and Color
http://micro.magnet.fsu.edu/primer/lightandcolor/java.html

Colorworm Explains Color
http://php.iupui.edu/~pellison/colorworm/home.html

KEY TERMS

Students will benefit from a review of these terms before attending this program.

Concave-Curved inward

Convex-Curved outward

Electromagnetic Spectrum-Entire frequency range of electromagnetic waves

Laser-Light Amplification by Stimulated Emission Radiation

Lens-A piece of shaped glass or plastic that causes the path of the lights rays passing through it to meet or spread out

Reflection-The bouncing back of light when it hits a barrier

Refraction-The bending of light when it hits a surface and changes speed

SUGGESTED ACTIVITIES

Bending Light

When light travels from one medium to another, it may bend

MATERIALS: aquarium, water, flashlight

PROCEDURE:

1. Fill a glass tank or aquarium with water. Darken the classroom.
2. Shine a lighted flashlight from one end of the tank to the other. The beam will pass straight through the tank when it hits the glass at 90 degrees.
3. What if you send the light beam through the water at an angle other than 90 degrees?
4. Experiment and see. What effect does the angle have on how sharply the light bends? Compare the angle where the light enters the tank to the angle of light leaving the tank.

Make Your Own Prism

A prism can separate light into a spectrum of color.

MATERIALS: plastic container, water, mirror, sunlight, slide projector or electric light
PROCEDURE:
1. Fill a clear plastic container with water.
2. Lay a mirror at an angle on one side of the container.
3. The mirror should stick up about half way in the water.
4. Allow bright sunlight (or electric light, like the beam from a slide projector) to travel through the water and hit the mirror.
5. Aim the reflected light onto a white surface like a wall. What happens to the white light? Where is the reflected light appearing? Why? What colors do you see?

Seeing Images

Make a pinhole camera

MATERIALS: small cardboard box, scissors, tape, and tracing paper

PROCEDURE:
1. Find a small cardboard box that does not let light through.
2. Use a pair of scissors to cut out one side of the box.
3. Tape a piece of tracing paper over the cutout side of the box. Make sure that the tracing paper is kept as smooth as possible.
4. Make a pinhole in the side of the box opposite the tracing paper.
5. Point the pinhole at a window.
6. Move toward the window until you see its image on the tracing paper. What do you see? Why is the image upside down?

Light rays in air appear to travel in straight lines. Rays of light from the window enter the pinhole in straight lines and hit the tracing paper. The light rays from the bottom and the top of the window cross over as they pass through the hole, so the image appears upside down.

Mixing Colors

TVs and Photographs are pictures made up of lots of tiny, colored dots. How do the dots mix to make colors?

MATERIALS: poster board, a compass, pencil, ruler, markers or colored pencils

PROCEDURE:
1. Use a pencil and a pair of compasses to draw circles of different sizes onto white poster board.
2. Cut them out with scissors. Divide the circles into equal sections and decorate each section with different colors.
3. Push a sharp pencil or stick through a hole in the center of each circle.
4. Spin the spinner as fast as you can on a tabletop. What do you see? Try other color combinations.

The colors appear to merge because the spinner is turning so fast that instead of seeing separate colors, out eyes see a mixture. White light is made up of the colors of the rainbow, so a spinner decorated with red, orange, yellow, green, blue, and violet with appear white when spinning fast.