

Enlightening Explorations, Part II

Summary

This lesson contains three student activities: Light, Angle of Reflection, and Refraction.

Group Size

Small Groups

Materials

Light

- [Light worksheet](#) (pdf)
Two copies of [Protractor](#) (pdf)
Two flat mirrors with mirror stands
Two hinged mirrors
Two laser pointers
Two teddy bear counters
- [Alphabet Letters](#) (pdf)

Angle of Reflection

Hit the Target

- [Hit the Target worksheet](#) (pdf)
Two laser pens
Two targets made from 3" x 5" index card folded in half
Six mirrors with mirror stands

Refraction

- [Refraction worksheet](#) (pdf)
Two opaque cups
Two pennies
Eight pencils
Graduated cylinder
1-liter bottle of water
Eight baby food jars or transparent cups (4 with lids)
Small amount of vegetable oil, corn syrup, and rubbing alcohol

Additional Resources

Book

Horrible Science: Frightening Light , by Nick Arnold; ISBN 0-439-20724-X

Videos

Light Optics , by Bill Nye (Disney Educational Productions, 1-800-295-5010, <http://dep.disney.go.com/educational/index>); Product ID: 68A86VL00

All About Light , (Schlessinger Media, 1-800-843-3620, <http://www.libraryvideo.com>); VHS K7109, DVD V8854

Assorted Media

Light, Color and Sound GeoKit , Includes three videos on light, color, and sound, as well as transparencies and lesson ideas. (National Geographic) This can be purchased for \$259.95; #NA90640

Background for Teachers

The Law of Reflection states that when light hits a surface, it is always reflected at the same angle it strikes the surface: *the angle of incidence equals the angle of reflection*. This is best demonstrated by

throwing a ball at a smooth surface. The angle at which it hits will equal the angle at which it bounces back (45° going in equals 45° going out). The angle at which you throw the ball is called the *angle of incidence*, and the angle at which the ball bounces back is called the *angle of reflection*.

Light travels in straight lines, but it bends as it passes from one transparent medium to another at an angle. This is called *refraction*. A good example of this is placing a pencil in a clear glass of water. The part of the pencil above the water appears to be broken off from the part below the water. When the light travels at an angle, one part of the light will reach the water before the other, so it slows a little before the other part slows.

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
4. Communicate Effectively Using Science Language and Reasoning

Instructional Procedures

Invitation to Learn

As students continue labs, show an example on the overhead projector of two different sample lab sheets. Have students discuss good things about them, and what could be improved.

Instructional Procedures

Have students continue with [science labs](#) (pdf).

Extensions

After looking at several kaleidoscopes, challenge students to recreate a kaleidoscope pattern on paper.

Students with special needs can work with learning buddies to complete the task. They may also be assigned copying the words rather than composing whole sentences or paragraphs.

Family Connections

This state Web site provides interactive exploration for students and their families. Click on the Light and Color box to get to the light activities.

<http://www.usoe.k12.ut.us/curr/Science/core/6th/sciber6/6th/index.htm>

This Web site is filled with light information, experiments, and great things for children and families to learn. <http://www.gomilpitas.com/homeschooling/explore/optics.htm>

Assessment Plan

While students are learning about light, it is always helpful to review what they have learned to determine if more time needs to be spent on explanation before moving on. The following questions would work well with whiteboards where all students write a short answer to the question. This provides quick, accurate assessment to guide your curriculum.

If the angle of incidence is 25° , what is the angle of reflection? (25°)

What do we call an object that allows only some light to pass through? (*translucent*)

Which object will make the best shadow—translucent, transparent, or opaque? (*opaque*)

Draw light hitting an uneven surface. (*Student should draw light scattered in all directions.*)

List the colors in order as seen when light hits a prism. (*ROY G BIV*)

Which color best reflects the colors of light? (*white*)

Draw light being refracted. (*Student draws light refracted through water, or pencil in water.*)

Draw a natural light source. (*sun, stars, fire, lightning, etc.*)

Write whether the following examples are refraction or reflection:

A prism bending light. (*refraction*)

A straw seeming broken inside a glass of water. (*refraction*)

A kaleidoscope. (*reflection*)

The ocean looking very blue under a blue sky. (*reflection*)
A sea shell looking closer than it really is. (*refraction*)

Authors

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