ARIZONA SCIENCE CENTER
ACTIVITY GUIDE

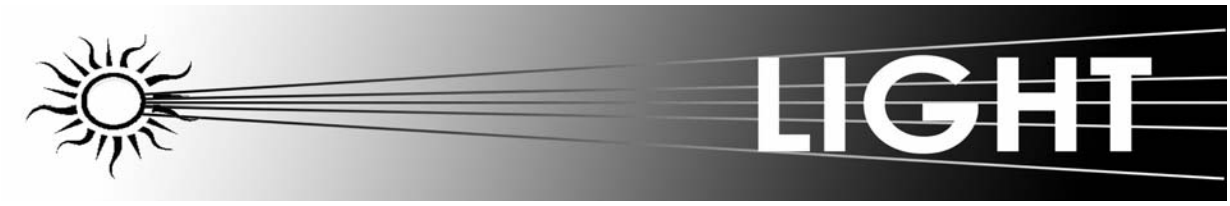
ARIZONA SCIENCE CENTER
HANDS-ON, EYE-OPENING FUN

Third Grade Activity Guide

These activities have been developed for use in the classroom or at home as a way to introduce some very basic concepts to your child or student. You may also use them as pre- and/or post-visit activities when planning a field trip to the Center. The supplies required for each activity are inexpensive and easy to find – you probably have most already!

These activities are aligned to the Arizona State Science Standards for third grade, however, only standards that are supported at the Arizona Science Center – light, sound, and some Earth materials - are represented.

Have fun!



Light is energy you can see, an energy called electromagnetic (EM) radiation. There are other kinds of EM radiation too – like radio waves, microwaves, and x-rays, but light is the part of EM radiation that you can see. Nearly all of the Earth's light comes from the sun – a whirling cloud of very hot gasses. These gases glow very bright and have been giving out visible light for millions of years. Light travels through space in the form of waves – in a perfectly straight line, until something bends them. The straight paths of light are called light rays. Light travels about 186,000 miles per second, so light from the sun takes about 8 minutes to go 93 million miles to Earth. If this seems slow, how does this sound: If you drove to the sun at 60 miles per hour, it would take you 177 years to get there!

You see things when light is reflected from them into your eyes. It is very simple - when there is no light, you cannot see. Your eyes allow you to see things in color and in focus. They also help you to judge distances. Your eyes receive images, and these are sent as impulses along nerves to your brain, which interprets them.

Back at You!

Standard
Strand 5: Physical Science
Concept 3: Energy and Magnetism
PO1: Demonstrate that light can be reflected

Supplies
Per student or small group: one hand-held mirror, and flashlight.

Activity
Shine the flashlight on the mirror at different angles and see what happens. If you hold the mirror at an angle and shine the flashlight on it, does the light bounce back? Now go into a room where there is another mirror. See if you can get the light to reflect off the first mirror, into the second.

What is happening?
Reflections are caused by light bouncing off of things. You can see some objects because they give off their own light like lamps, fires, and the sun. They send the light directly into your eyes. However, most objects do not give off their own light. You can only see these objects because light (from a light source like a lamp or the sun) bounces off of them before it enters your eyes. Reflection is like a ball bouncing off of a wall.

Mysterious Light

Standard
Strand 5: Physical Science
Concept 3: Energy and Magnetism
PO1: Demonstrate that light can be absorbed
PO2: Describe how light reacts to objects that are: transparent, translucent, and opaque.

Supplies
Per student or small group: flashlight, notebook or paper, 2 pieces of black paper, 1 piece each of wax, stiff, clear plastic (sheet of overhead transparency film would work well), and beige paper.

Activity
Place one piece of black paper on the table. Starting with one of your items (paper, plastic, etc.), hold it above the black paper on the table, and shine the flashlight down on it. What do you see on the black paper below? Did some light go through? No light?

Now, do the same with each of the items. Record in the notebook the result you had for each of the items. Now, put them into categories based upon your discoveries of how light interacted with each of them. What were your results? How many categories did you come up with? What information did you use to divide the materials into categories?

What is happening?
Light does different things when it hits different objects. If an object is transparent, light can pass through it. If it is translucent - it will absorb some light but also let some light pass through it. If it is opaque, no light can get through.

Based upon what you just learned, do your categories correspond with objects that are transparent, translucent and opaque? Can you find some other examples of translucent, opaque, and transparent objects in your house or classroom? Test some other objects you can find.

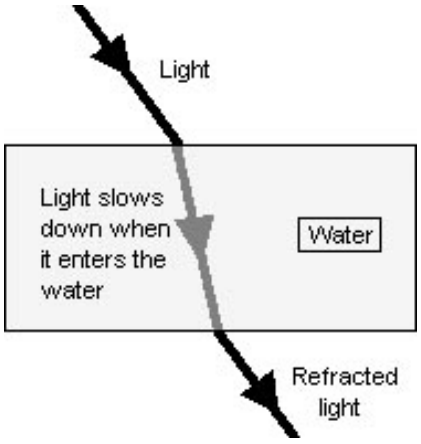
Watery Vision

Standard
Strand 5: Physical Science
Concept 3: Energy and Magnetism
PO1: Demonstrate that light can be refracted

Supplies
Per student or small group: clear jar of water, ruler, pencil, and a ping-pong ball.

Activity
Have you ever reached down into a bathtub or pool to grab something, only to discover that it was not where you thought it was? Do you know why that happens?

Give students a jar, ruler, and a pencil. Fill the jar with water and put the ruler in. Now, turn the glass so that the ruler is sideways and have students look carefully. What do they see? Does the ruler look straight? Leave the jar filled with water but remove the ruler. Now place the pencil in the jar. Now, turn the jar and look from different sides. What do they notice?



What is happening?
Light travels more slowly through water than through glass or air.
Because of this, the light's direction changes a little bit causing you to see the pencil and ruler in two different places. The top part of the objects you see only through air and the glass. The bottom parts you see through water, air, and glass, making them appear to be in different places than in the top parts.

Activity
Now, take the jar of water and dip your thumb into it. Examine your thumb through the side of the jar. Now try wiggling it. What does your thumb look like? Shorter, longer, fatter or thinner? Now, take out the ping-pong ball. Push the ball under water with your thumb. What does the ball look like?

What is happening?
The water in the jar bends light rays making it act like a magnifying glass. Basically, when light passes through a curved, transparent object (called a lens), it is refracted. When light is refracted, it actually bends, causing objects to appear different. Cameras, magnifying glasses, binoculars and microscopes all have lenses that refract light.

When something moves quickly back and forth, it is vibrating. You hear a sound when a moving object makes the air vibrate. These vibrations are called sound waves and can travel through any substance, whether it is a solid (like metal), a liquid (like water), or a gas (like air), but the speed at which sound waves travel is different in each substance. Substances are made up of molecules. The more tightly "packed" the molecules are, such as in solid objects, the quicker the sound waves can travel. More loosely "packed" molecules (like air), cause the waves to move more slowly. Sound waves travel the fastest through solids, followed by water, and then air.

Vibrations also create different notes, or pitch. High-pitched sounds, such as the sound of a whistle, create waves that are close together. Lower-pitched sounds, like thunder, create waves that are farther apart. The pitch of a sound is determined by its frequency. Frequency is the number of waves that pass a point in one second. The higher the frequency, the higher the pitch. The lower the frequency, the lower the pitch. The length of a vibrating object contributes to the pitch.

Balloon Talk

Standard
Strand 5: Physical Science
Concept 3: Energy and Magnetism
PO3: Demonstrate that vibrating objects produce sound

Supplies
Per two students: one large balloon.

Activity
Feel vibrations by blowing up a large balloon. One person, putting their mouth on the inflated balloon, speaks while one person places their hand on the other side of balloon. What do you feel?

What is happening?
You can feel sound vibrations as they travel through substances. Have you ever felt your cat as it purred? Touched a ringing alarm clock? Put your hand on a speaker when playing loud music? What did you feel? Some people who are deaf dance in time to music by feeling the vibrations sounds make!

Squawkers

Standard
Strand 5: Physical Science
Concept 3: Energy and Magnetism
PO3: Demonstrate that vibrating objects produce sound
PO4: Demonstrate that the pitch of a sound changes as the result of a change in the rate of the vibration

Supplies
Per student: scissors, and one non-bendable straw.

Activity
Make a squawker to experiment with pitch. Take a straw, and flatten one end (you can use a book). Now, on the flat end, make two diagonal cuts as shown below.

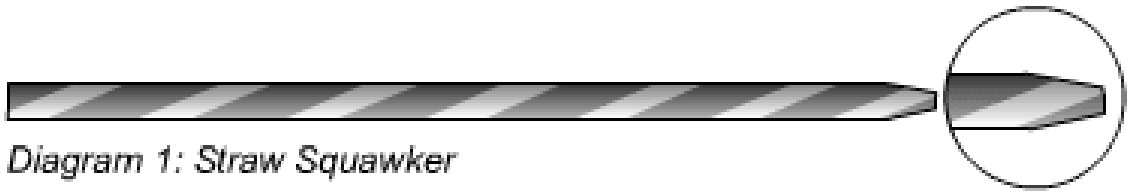


Diagram 1: Straw Squawker

Image from **whyfiles.larc.nasa.gov/.../ inclass/squawker.html**

Ask your students what “pitch” the squawker will produce - a high or low one. What happens when it gets shorter? Now, as the student blows into the squawker, a helper

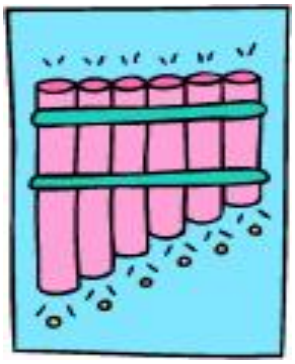
takes the scissors and begins to shorten the straw. Have the other student do the same. What happens?

Panpipes

Standard
Strand 5: Physical Science
Concept 3: Energy and Magnetism
PO3: Demonstrate that vibrating objects produce sound
PO4: Demonstrate that the pitch of a sound changes as the result of a change in the rate of the vibration

Supplies
Per student: 6 straws, scissors, and tape.

Activity
In South America, people play a musical instrument called a panpipe. This instrument contains many pipes of varying lengths. Create a panpipe using drinking straws, tape and scissors. Give each student 6 straws, tape, and a pair of scissors. Have students tape the straws together – side by side like the illustration. Cut the bottoms of the straws diagonally, so that they are <u>all different lengths</u>.



Have the students blow air across the top of their panpipes! Ask them: How is sound made with the panpipe? Do all the straws make the same sound? Why or why not? What happens if you block a straw at the end with your finger? Is the sound different? Does it still make sound?

What is happening?
When the air inside is made to vibrate, it produces a sound. The length of the pipe determines the pitch produced by the vibrating column of air. The shorter the pipe, the less air there is to vibrate and the higher the pitch. A long pipe contains a greater volume of air and vibrates more slowly, producing a lower pitch.

EARTH MATERIALS

Earth materials are materials from the Earth like soil, rocks, minerals and fossil fuels. This would also include things grown in soil. Almost everything around us has been made from, or is, an Earth material – vegetables, fruits and grains, salt, aluminum foil, baby powder, building materials, iron, cement, etc.

We Love Rocks!

Standard
Strand 1: Inquiry Process
Concept 2: Scientific Testing
PO5 record data
Strand 6: Earth and Space Science
Concept 1 - Properties of Earth Materials
PO3 classify rocks based on the following physical properties: color and texture

Supplies
The book, *"Everyone Needs a Rock."*

Activity
Read your students "*Everyone Needs a Rock*." Then, have your students find six rocks (different from each other) from home or school. Students should wash the rocks and bring them in to class. Have students spread out all of their rocks on their tables, then have them get up and look at all of the rocks that were brought in. After they are seated again, ask them: Do your rocks all look alike? Do some look the same? Do some look different? How do you think you could categorize them? Why?

Next, have each group put all their rocks together in a pile. Have them then sort the rocks by color. Have students write down what they notice about the colors [what shades of color, more than one color in a rock, etc.] Now have them put the rocks back into a pile, and sort them by texture. Again, have them record what they notice. [Hard, rough, bumpy, etc.]

Ask students: What did you notice about your rocks? Why do you think rocks feel differently? Why do you think rocks can be different colors? How do you think rocks are made? **Do you think all rocks are made the same way?**

What is happening?
Rocks come in many sizes, colors, and textures, and are made from 2 or more minerals.

Time to Brush

Standard
Strand 6: Earth and Space Science
Concept 1 - Properties of Earth Materials
PO6: Describe ways humans use earth materials

Supplies
Calcium Carbonate (Tums - ground up - coffee grinders work great!), Sodium Bicarbonate (baking soda), 2 small plastic spoons, Small cups (Dixie cups, etc.), plastic cups for water, straws, and craft sticks.

Activity
Give each student one small cup, one plastic cup with a small amount of water, one straw, and one craft stick. Have each student put **one (not heaping**) spoonful of calcium carbonate, and **½ spoonful (not heaping**) of sodium bicarbonate into their cup. Using the straw to draw water (finger over top method), have students **slowly** drop water into the cup, and mix with a craft stick until the material becomes paste-like.

Ask students: *What did you just make? What do you think the main ingredients for toothpaste are?*

What is happening?
Earth materials - minerals! We used sodium bicarbonate (baking soda), and calcium carbonate (Tums). These minerals clean and scrub your teeth.