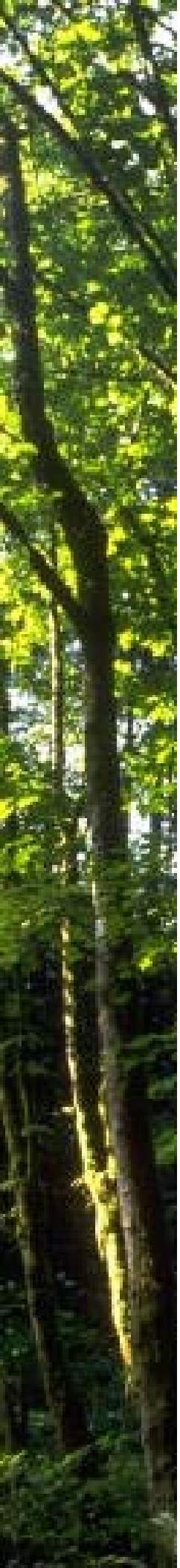


Rain Forest Teaching Curriculum

Table of Contents

Welcome to Rain Bird's Rain Forest Teaching Curriculum!

The Rain Bird Rain Forest Teaching Curriculum features "I can relate to that" science learning tools for teachers, students, and parents. The following is a list of answers to some frequently asked questions about the Rain Bird Rain Forest Teaching Curriculum:

What is it?

Rain Bird's Rain Forest Teaching Curriculum is an online educational tool for teachers to use and find specific lesson plans and related course work for kindergarteners through high school seniors. This content is also available online at www.rainbird.com.

What is its purpose?

To teach natural history, ecology, biology, physics, and chemistry through demonstrations, experiments, and classroom activities. Rain Bird and California State Polytechnic University, Pomona (Cal Poly Pomona) designed the program content, which focuses on endangered tropical rain forests in Latin America, South America, Africa, and Southeast Asia as the basis for teaching science through fun, hands-on things children already do and like—art projects, outdoor activities, and classroom demonstrations. The curriculum motivates kids to think about the part each of them plays—or the actions they can take—in preserving and protecting the environment.

Who should use it?

Teachers and parents. Teachers who are seeking a new, fun and engaging resource to teach children about science. Parents who are looking for friendly, but educational how-to's on "bringing science home." But most of all, it offers something for just about anyone and it's just plain fun for kids, no matter what their age.

Is the information easy to use?

Yes! The information is well organized and self-explanatory. The curriculum is arranged with grade-appropriate material (K-1, 1-2, 2-3, 3-4, 4-5, 6, 7, 8, and 9-12). As appropriate, each grade level contains projects that integrate science with art; data gathering, observation, and inference; analysis of physical matter; in-class demonstrations to be performed by teachers for students; and at-home projects that illustrate scientific principles in a manner both understandable and meaningful to school-age children.

Why the focus on rain forests?

Rain Bird has always supported and educated its consumers on the importance of the "Intelligent Use of Water." The curriculum ties into this philosophy because rain forests provide oxygen and consume carbon dioxide, playing a pivotal role in the climate control of our planet. This affects wind, rainfall, humidity, and temperature worldwide. Rain Bird is deeply concerned about the environment and has always promoted stewardship of Earth's resources, or which water is among the most precious. Some 30 million species of plants and animals—a majority of all things living on Earth—exist interdependently in tropical rain forests. In addition, rain forests are rich with plants vital in creating modern medicines.

What has the response to the curriculum been?

Thousands of online visitors each month learn about the important role tropical rain forests play in the world. And, because the information is being so well received, Rain Bird has expanded its commitment to university-level education through its partnership with California State Polytechnic University, Pomona. Jointly, they will unveil in 2002 three Rain Bird Learning Centers at Cal Poly Pomona's BioTrek Project, located on the Cal Poly campus.

About Rain Bird

Rain Bird Corporation, based in Glendora, California, USA, is the world's largest manufacturer of sprinkler and drip irrigation equipment. Founded in 1933, Rain Bird offers the industry's broadest range of irrigation products to golf courses, sports arenas, amusement parks, farms, and commercial and residential developers in more than 130 countries. For more information, visit Rain Bird's web site at www.rainbird.com.

This workbook is brought to you through a partnership between:

Rain Bird, Azusa, California

Science IMPACT, College of Science,
California State Polytechnic University, Pomona

The Rain Forest: An Introduction

What is a tropical rain forest?

A tropical rain forest is a forest that receives 4 to 8 meters of rain each year.

Where are tropical rain forests located?

Rain forests are located within a narrow region near the equator in Africa, South and Central America, and Asia.

Why are tropical rain forests important to our earth?

Rain forests play an important role in the climate control of our planet by having an affect on the wind, rainfall, humidity, and temperature. Within the rain forest, water, oxygen, and carbon are recycled. This natural recycling helps to reduce flooding, soil erosion, and air pollution.

The rain forests support over one half of the plant and animal life on Earth, even though they cover only 2% of the Earth's surface.

Approximately one fourth of the pharmaceuticals (medicines) we use come from plants of the tropical rain forests. According to the National Cancer Institute, 70% of the plants from which we make medicines and that are effective in the treatment of cancer can only be found in the rain forests.

What is happening to our rain forests?

27 million acres of the Earth's rain forests are destroyed each year due to man. The activities which threaten the rain forests are: agriculture, clearing and developing of land, beef cattle ranching, logging, and the building of dams and hydroelectric plants. This results in a loss of 100 acres of rain forest per minute and 80% of the rain forests in the world are now gone. The destruction of the world's rain forests at this rate causes 10,000 plant and animal species to become extinct each year.

Grades K-5 Activities Overview

Curriculum materials are divided into grade level segments. Within the segments for grades K-5, there are four components of curriculum materials:

- **Science Through Art** – These activities integrate science and artistic skills, such as coloring, drawing, painting, and printmaking.
- **Interactive Science Activity** – These activities are experimental in nature, requiring students to take data, make observations of the data and, at higher grade levels, to make inferences from the data.
- **Outdoor Activity** – These activities allow students to gather materials from the field and perform scientific analyses, appropriate to their grade level, on the materials that they bring in from their excursion to the outdoors.
- **In-Class Demonstration** – These activities are demonstrations to be performed for the students by the teacher, using commonly available materials, and primarily related to physical science aspects of rain forest phenomena.

Grades 2-3 Activities At a Glance

- Science Through Art: Flower Construction
- Interactive Science Activity: Making an Elastic Material
- Outdoor Activity: Flower Hunt and Dissection
- In-Class Demonstration: Reflection of Light

Grades 2-3 Science Through Art Activity: Flower Construction

In this activity the students learn the structures of the flower by constructing a flower model.

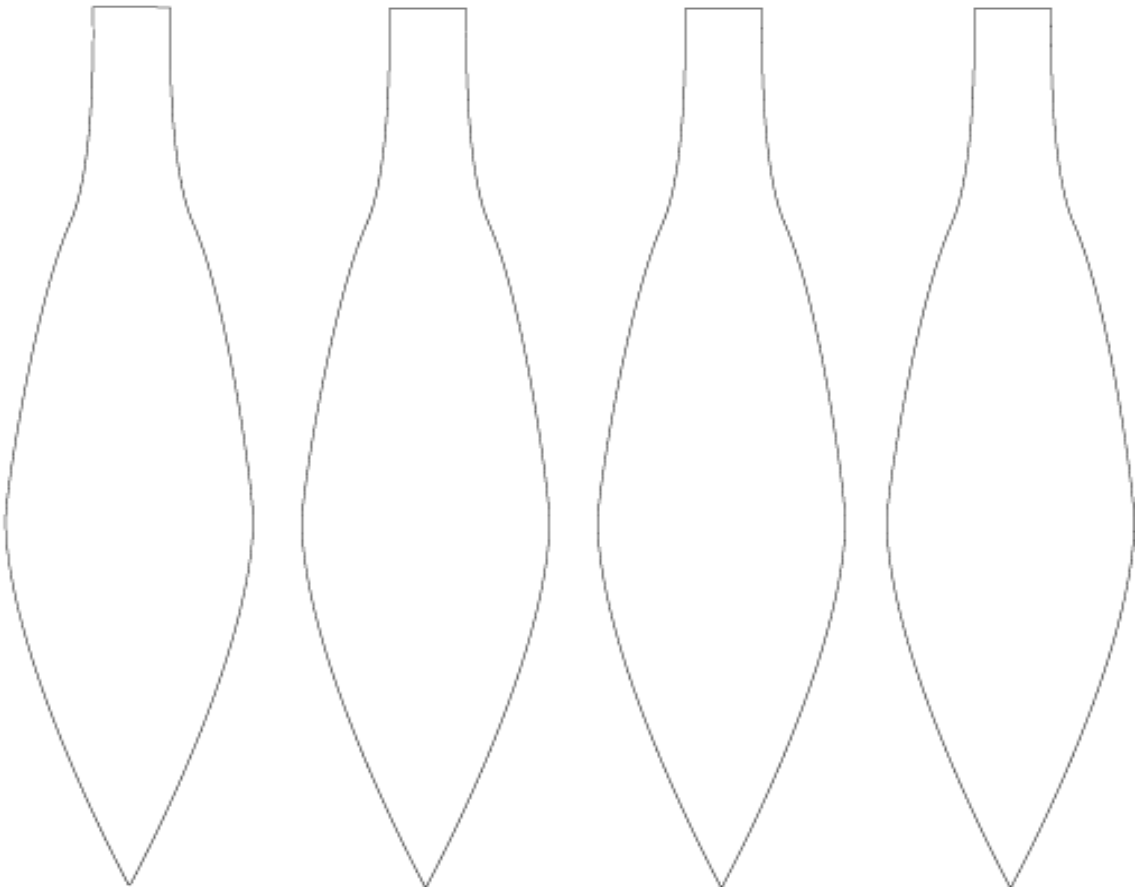
Materials:

Flower pattern from this workbook, bendable soda straws (5 per flower), colorful construction paper, glue, clear tape, and Styrofoam packing peanuts (5 per flower).

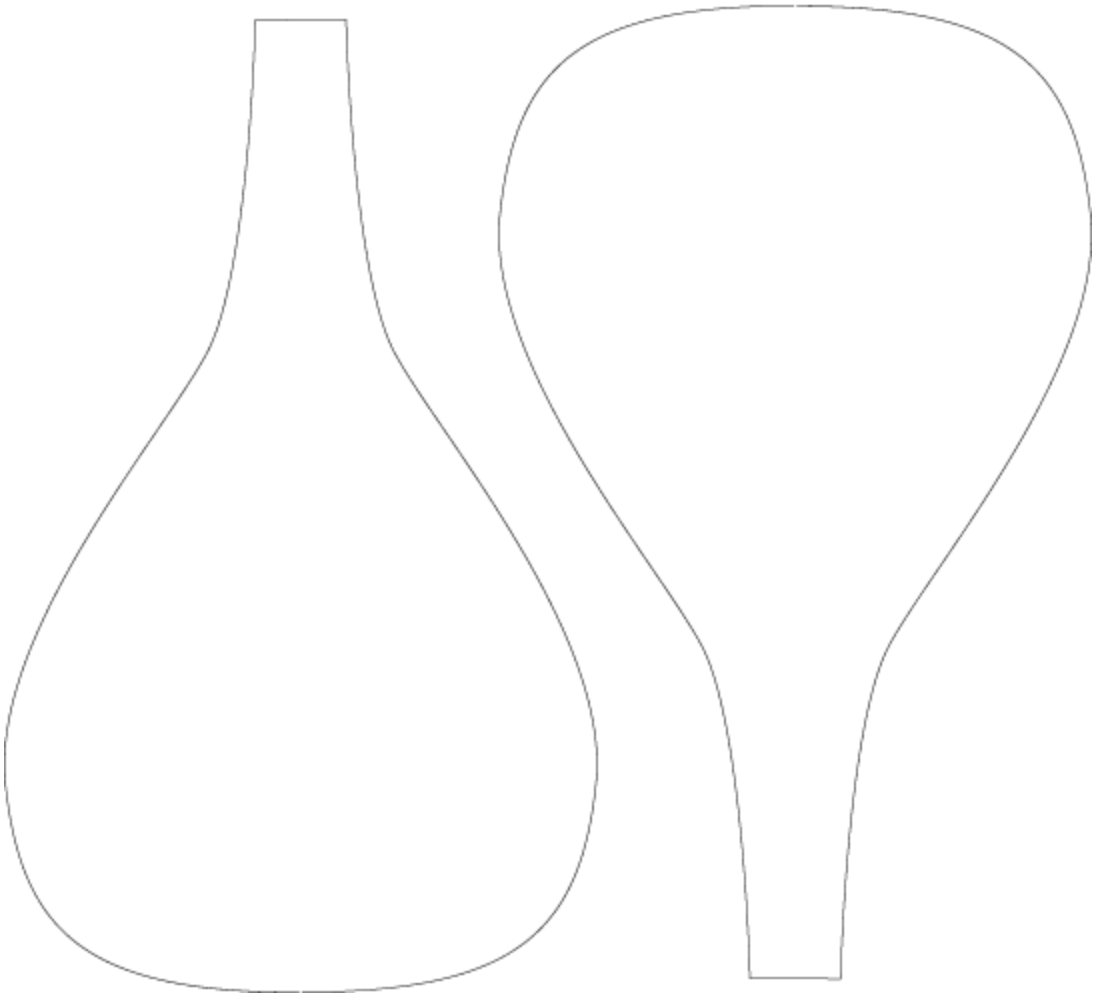
Procedure:

1. Print the flower pattern (below) and reproduce a copy for each student.

Sepals:



Petals (print two copies for a total of four petals per flower)



2. Have students trace around the pattern onto a piece of colored paper, being certain to print the sepals on green paper. (As an alternative, photocopy the pattern on colored paper. Students can then simply cut out the components without the need for tracing.)

3. Begin construction by securing 4 of the straws around a central fifth straw with tape. The straw in the middle should have the bendable end down while the other 4 are positioned with the bendable end up. The five straws together will constitute the stamens and pistil structures of the flower.

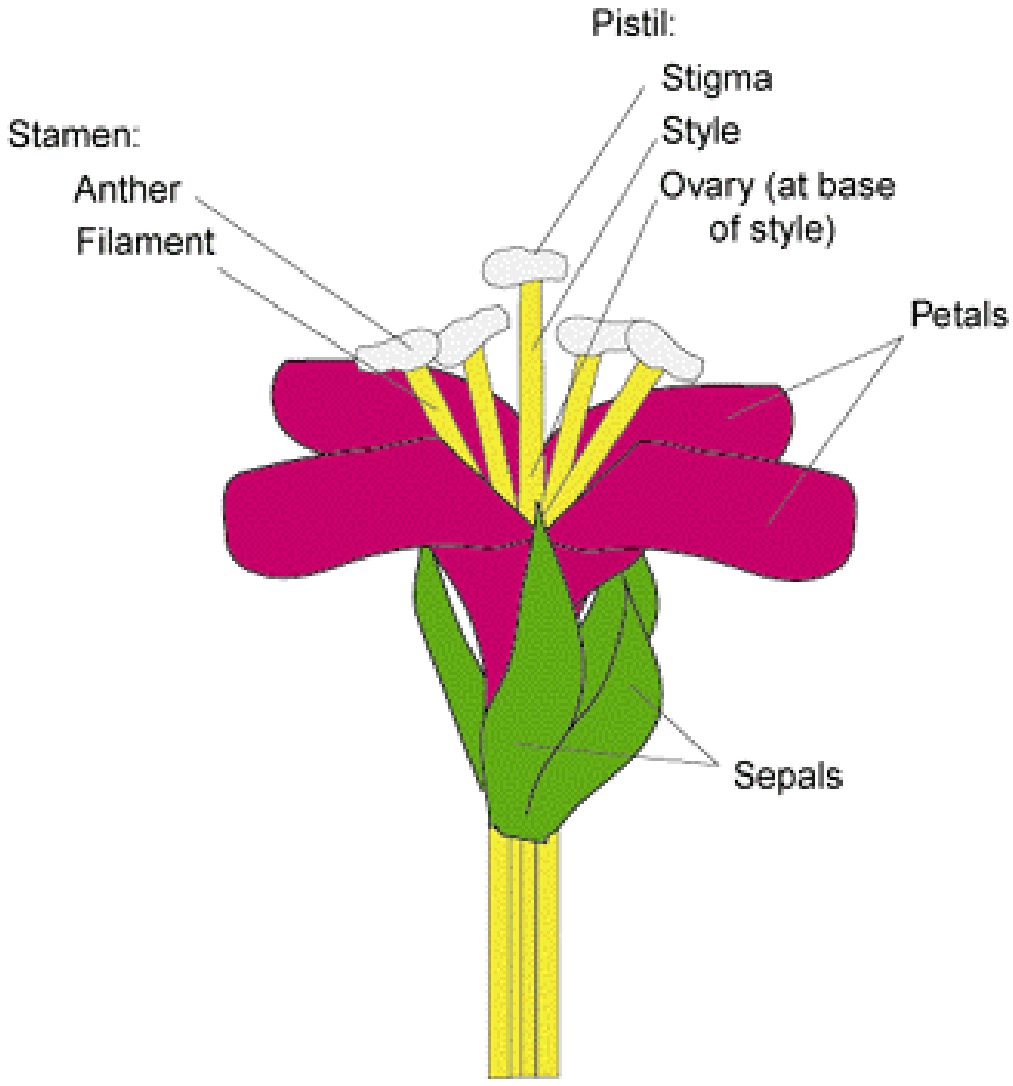
4. Attach a packing peanut to each of the four stamens, by simply pushing the peanut onto the end of each stamen. Bend each stamen away from the central straw.

5. Attach the fifth packing peanut, which will serve as the stigma, by gluing it on the top of the center straw, which represents the pistil.

6. Using a pencil, gently roll each petal around the pencil to give the petals a curve.

7. Place the petals (curving outward) evenly around the straws and secure with tape.

8. Place the sepals evenly around the petals and secure with tape.



Grades 2-3 Interactive Science Activity: Making an Elastic Material

Several species of plants and trees in the rain forests yield a milky white substance when the stems or trunks are cut. Historically, the native peoples of the rain forests found ways to use this substance, called latex or rubber, to waterproof bags, to make chewing gum, and make medicinal chewing gums by adding other plant ingredients. In this activity, white glue (a chemical polymer), water, and boraxo soap powder are used to model the making of a rubbery product.

Making an elastic type of material is an excellent way to introduce the topic of polymers. This is a very inexpensive way to allow students to experiment with the ratio and proportion of the ingredients that make this compound. They will learn quickly that accurate measurement results in a better quality product.

Materials:

Tap water, Elmer's Glue, all white glue, 4% borax solution (sodium borate, $Na_2B_40_7$ 10 H_20; 20 Mule Team Boraxo powdered hand soap is available at the grocery store), stirring rod (coffee stirrers work well), paper towels, plastic drinking cups (4 oz size is fine), plastic sandwich bag to store completed putty, some type of metric measuring device, such as a graduated cylinder, or kitchen measuring cup.

(A 4% borax solution is made by adding 4g of borax to 96g of water. If there is not a balance and a graduated cylinder available, place 1 level tablespoon of borax in 1 cup of water. Two batches will be plenty for a class of students.)

Procedure:

1. Measure 25 ml of Elmer's glue into a plastic drinking cup.

2. Add 20 ml of tap water to the glue. (In the event that you have nothing with which to measure liquids, this is roughly a 50/50 mixture of glue and water.) Five drops of food coloring can be added if desired. Stir very well until the ingredients are completely mixed.

3. Add 5 ml of the 4% borax solution. Again, if you have nothing with which to measure liquids, add 50 drops since 10 drops is roughly 1ml. Stir well.

4. A solid material will begin to collect on the stirrer. Remove the solid material and place it on a paper towel. Knead the material with your fingers. The material will be

sticky for about a minute or two. It will become more puttylike as the substance loses excess water.

Questions for Students:

1. Does the material stretch? Does it go back to its original shape when you release it after stretching?

2. What happens when the material is pulled rapidly? What happens when it is pulled slowly?

3. If you roll a piece of the material into a ball, does it bounce?

Grades 2-3 Outdoor Activity: Flower Hunt and Dissection

As a follow-up to the flower construction in the 1-2 activity section, students collect flowers and bring them inside the classroom for dissection and identification of the structures in this activity.

Materials:

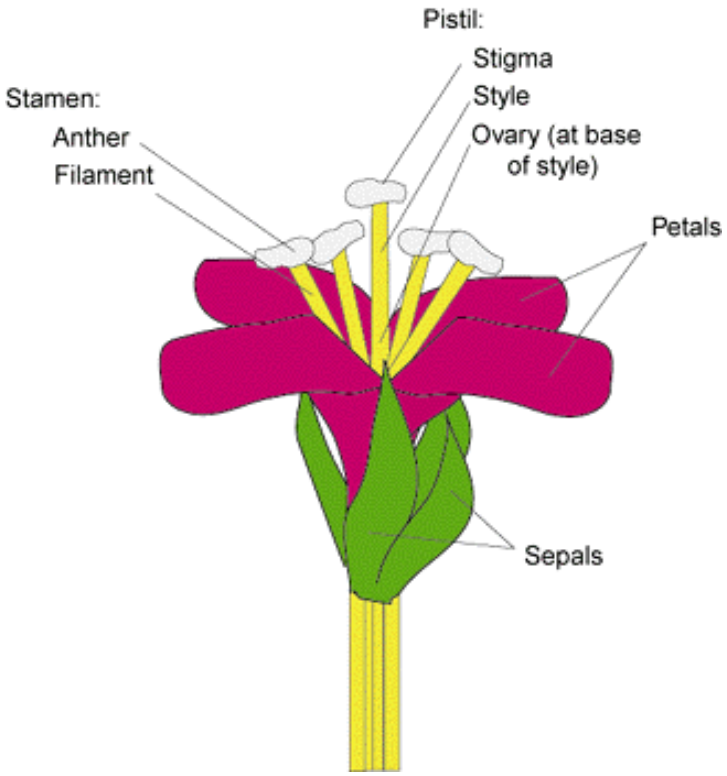
Flowers brought in by students, forceps, tape, and construction paper.

Procedure:

1. Using forceps, have the students dissect the flower completely and lay out the structures on a piece of paper.

2. Have students secure the flower structures to the paper with clear tape, then label the structures.

3. Have students identify the structures by comparing to the diagram.



Grades 2-3 In-Class Demonstration: Reflection of Light

When sunlight enters the trees of the rain forest, there are a number of possibilities for what happens to the light. It can reflect off leaves, bark, ground, or water droplets. It can also be absorbed by any of these surfaces. In the 1-2 Light Absorption demonstration, light was absorbed in varying amounts by the different colored socks. In this demonstration, we will investigate reflection of light from different surfaces.

Materials:

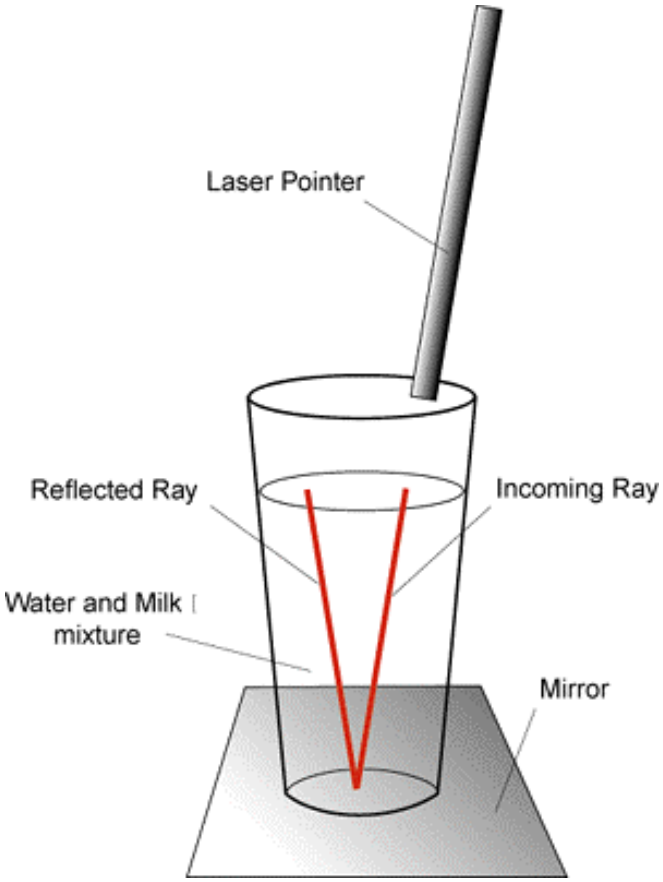
Laser pointer, clear drinking glass, pocket mirror, water, milk, leaves brought in by students, white paper.

Procedure #1:

1. Place the drinking glass on top of the mirror, with the reflecting side of the mirror facing upward.

2. Fill the glass with water, and add a few drops of milk to the water. Stir the water, so that it appears slightly cloudy.

3. Shine the laser pointer into the surface of the water so that it reflects from the mirror below the glass and you can see the reflected ray of light moving upward in the water.



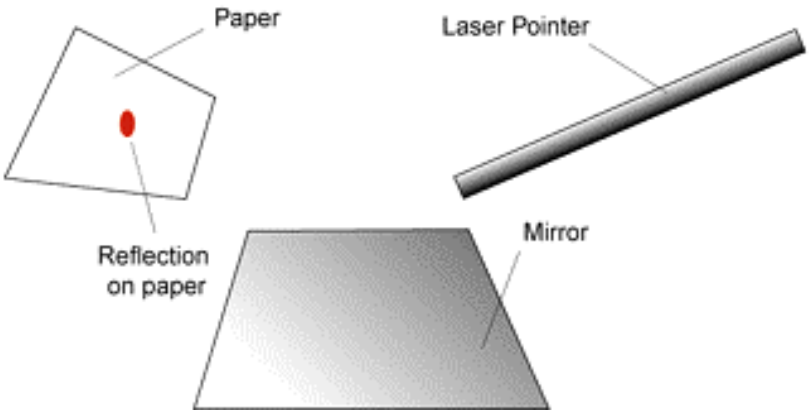
Questions for Students:

1. Can you see the light from the laser pointer in the air between the pointer and the water? Why not?

2. Why can you see the light from the laser pointer in the water?

3. Why is the light going upward from the bottom of the glass?

Procedure #2:



1. Remove the drinking glass. Shine the laser pointer onto the mirror. Hold a piece of paper near the mirror and move the paper and/or the laser pointer until the reflected light is seen on the paper. The diagram shows a typical arrangement of the laser pointer, mirror, and paper. Point out that the light is reflecting from the mirror and up onto the paper. The path is similar to that in Part I, but the path of the light cannot be seen as it was in Part I.

2. Now, replace the mirror with various leaves brought in by students. Using the same technique as with the mirror, see if you can observe light from the laser pointer reflected from a leaf onto the paper. The reflected light will be darker than for reflection from the mirror, and will be more spread out into a larger circle on the paper, but should be visible for some leaves.

3. Have students categorize the leaves into two groups - those that reflect light and those that do not. The leaves that reflect light should appear shiny, while those that do not should appear dull, in response to Question 2 below.

Questions for Students:

1. How would you describe where you have to hold the paper and the laser pointer to see the reflection of the light from the mirror?

2. Look at the leaves in the two groups. Can you describe how the leaves in the two groups look different from each other?

3. If you were able to measure the temperature of the leaves in sunlight, which group of leaves do you think would become warmer?

4. For the group of leaves that do not reflect light, what happens to the light when it hits the leaf?