

Bending Light

Summary

Students will learn about refraction of light by experimenting with various objects.

Time Frame

1 class periods of 45 minutes each

Group Size

Small Groups

Materials

- *Hatchet*
by Gary Paulsen
- Science Journals
- Pencils
- An Aquarium or Clear, Deep Dish
- Water
- Milk (1 Tablespoon)
- Flashlight
- Spoon
- 2 Clear Drinking Glasses
- Opaque Bowl
- Penny

Background for Teachers

Refraction is one of many characteristics of light. Usually light travels in straight lines, but it bends as it passes from a medium of one density to a medium of differing density. Light bends because it travels at different speeds through mediums of differing densities. Light, as it moves through air, travels 186,000 miles per second. However, the denser the material that light is traveling through, the slower the speed will be. Light passes a lot slower through water, for example. Refraction of light can be seen by using a prism. The white light is separated into all of the colors of the rainbow. Mirages are also caused by refraction of light.

The book *Hatchet*, mentioned in the beginning of the lesson, is about a boy named Brian who becomes stranded in the Canadian wilderness when the plane he is on crashes. The section that is used in this lesson is about Brian trying to fish and realizing that the fish are not where he thinks they are in the lake because of refraction.

Intended Learning Outcomes

- Observe simple objects, patterns, and events, and report their observations.
- Compare things, processes, and events.
- Use data to construct a reasonable conclusion.
- Cite examples of how science affects life.

Instructional Procedures

Introduction:

Read pgs. 110-112 of *Hatchet*. Stop at the end of the second paragraph on page 112 ('...Maybe it was always that way, discoveries happened because they needed to happen.'). Start reading again

on page 124, the last paragraph that starts 'Mistakes...' and stop on page 125 at the end of the third paragraph ('...wiggling against the blue sky.'). After reading the pages in Hatchet, discuss with students why Brian was having a hard time catching fish. Put the word refraction on the board and define it as the bending of light as light passes through materials of differing densities. Have them write the definition in their science journals and write about the example found in Hatchet.

Part 1: Class Demonstration

With the entire class, demonstrate refraction by using an aquarium, flashlight, milk, and water. Fill the aquarium with water. Add a few drops of milk to the water, or more if needed. It should give the water a cloudy look. The milk will make it so that the light beam is easier to see as it passes through the water.

Shine a flashlight into the water. You may want to vary the angle of the light entering the water. The students should be able to see that the light bends as it enters the water.

Discuss with the students what happened. What causes the light to bend?

The students should be able to relate this experiment back to the definition and realize that light will bend if it travels from a substance that is less dense to a substance that is more dense.

Have them record the results in their science journal, making sure that they explain why the light bent.

Part 2: Learning Centers

In groups of 4-5 students, the students will rotate through various learning centers. The learning center activities are: Spoon in a Glass, Magic Penny, and Bending Rays. Give the students about 5-10 minutes in each and have them record the results of each learning center. Have the students take notes on their observations of each experiment.

Magic Penny

Materials: a penny, an opaque container, and water.

Put the container on the table and put a penny in the bottom of the container, without water in it.

One student needs to be standing up looking into the bowl at the penny.

The student starts moving away from the bowl, keeping his/her eyes on the penny until it disappears from sight. When the penny disappears, the student stops.

While the student is standing still, looking into the bowl, another student in the group slowly pours water into the container until the penny reappears in view.

Have the students discuss why this happened. They should record their observations and conclusions in their science journals.

Spoon in a Glass

Materials: A spoon, a clear glass, and some water.

Fill a clear, drinking glass full of water.

Put a spoon into the water and let the handle rest on the side of the glass.

Students should look into the glass from the side and describe what happened to the spoon. Why did that happen? Students should record their observations and conclusion in their science journals.

Bending Rays

Materials: A piece of paper, a pencil, a clear glass, and water.

Draw a vertical line on a piece of paper, about 4-5 inches long. Students may need to use a ruler.

Place the bottom of the glass on top of the line, so the line separates the bottom of the glass in half as students look at it from the top of the glass.

Keeping the head in the same place, pour water into the glass and record what happens to the line. Have the students record their observations in their science journals.

Conclusion:

After the students have rotated through all 3 learning centers, bring them together to summarize what they observed in each demonstration and how refraction was involved. Make sure the students

understand refraction of light. You may also want to discuss where they have seen refraction of light in their own lives. For example, mirages are caused by refraction, as well as rainbows.

Assessment Plan

Use the Science Journal Rubric to assess student journal entries.

Rubrics

[Science Journal Rubric](#)

Bibliography

Original Lesson Plan by: Lisa Coltrin

Authors

[Teresa Hislop](#)

[KIRSTIN REED](#)