Just Right: The Goldilocks Effect

Objectives

Students will be able to: 1) explain perspective, range and resolution; 2) explain how the optimal viewing zone varies with what it is they want to know, and that the "Goldilocks Principle" applies: they can be too hot (too close), too cold (too far), or just right, for any given investigation.

Method

Students view a large object such as a poster, store front, or even a brick wall from various distances and observe the difference in the information they can get from each perspective. The experiment can be repeated with arrangements of other common objects.

Background

The Goldilocks Effect is a term used by astronomers when comparing the distances from the Sun and the climates of Venus (too hot), Mars (too cold) and Earth (just right). Similarly, when aerial and satellite photographs are used to gather information about the Earth, the distance, range, and resolution of the pictures to be taken are determined by considering what data is required for the given investigation. For example, if you want to map forest cover, you do not need nor want to see each tree, and vice versa. In the activity, Learning to Look, Looking to See, students learned to turn on their sensors. In the "Goldilocks" experiment, students will grasp the concept that being closer is not necessarily better or more informative — the optimal point of observation, or perspective, depends upon what it is that you want to find out.

Age

Grades K-12

Subjects

Art, Language Arts, Math, Science

Duration

30-60 minutes

Skills

analysis, observation, prediction

Key Vocabulary

data, distance, perception, perspective, range, remote sensing, resolution

Materials

A large sign or poster, metric ruler or measuring tape, chalk, magnifying glass, note pads to record discoveries. For younger students, cookies or their names on tags as mentioned under procedure is a good variation.

Procedure

1. Set up a large poster, photograph or sign on an outside wall of the school at eye level, in a location that allows you to view the poster from far away (a gymnasium or a long hallway are a good indoor alternatives). Bring the class into view of the poster from so far away that they cannot tell what it is.
2. Have your students slowly approach the poster in small groups or one at a time. Have them approach in stages of an appropriate distance (maybe 10 meters or paces each time) and at each stage have

down what they see and what they think is on the poster. Have them continue until they can identify it. At that point, they should stop and mark the ground with chalk. They should then continue approaching the poster until they are so close they can no longer tell what it is; at this point, they mark the floor again. Finally, have them move right up to the poster and examine some detail of the poster with the magnifying glass and record what they see.

3. Students then measure the two distances from the poster. These distances define the range or "window" within which their "remote sensors" (eyes) are capable of gathering the most useful information. That window might be called the "Goldilocks Window" — not too hot, not too cold, but just right — for gathering information about the poster.

Discussion

1. Your students should discuss what kinds of information they observed from each of the various distances. They should try to frame questions that can be answered only from close up, but not from far away, vice-versa, and some questions that can be answered only from a medium distance.
2. You can then explain that when people want to know something about the Earth, they sometimes take pictures of it from airplanes and spaceships so they can get a perspective which is different from the one they have when looking at it from the ground. This is just like how your students got different perspectives on the poster from varying distances. Scientists gathering data by remote sensing do the same kind of exercise that your students just did. They figure out just how close or far away the camera needs to be to give them the information they want. Using analogies such as this, young students can begin to understand the concept of remote sensing and how it is used.

Extension

1. Give a slide show or show a video on the possibilities and limitations of remote sensing and the different "windows". A slide set and a video on remote sensing are available through the Aspen Global Change Institute.
2. Watch the video "Powers of Ten" and discuss the differences in perspective each power of ten reveals. (Available through most libraries, or from Pyramid Film and Video, Box 1048, Santa Monica, CA 90406 213-828-7577)