

Classroom Exercises: Pinhole Focusing

LEARNING OBJECTIVE:

To show that light travels in a straight line and can be focused to form an image or picture. To illustrate the effect a lens has in bending light rays.

MATERIALS:

Poster board, sheet of waxed paper, scissors, push pin, darning needle, masking tape, a drop light or table lamp shielded to emit the most light in one direction.

PROCEDURE:

Cut a piece of poster board about 12 inches square. Make a small, clean hole in the center of the poster board with a push pin. (Make sure the hole is very small and very sharp.) In a very dark room, ask one student to hold the poster board with the pinhole in line with, and between 5 to 10 feet away from, the drop light or lamp. Ask another student to hold the waxed paper about an arm's length away from the poster board. Explain that the waxed paper serves as a screen, and that an image focused by the pinhole will appear on that screen upside down.

Demonstrate this by asking a third student to hold an object, such as a scissors, between the light source and the poster board. Ask the student to move the waxed paper closer and farther away and ask students to tell you what they observe.

Conduct the same demonstration two or three more times, enlarging the hole gradually each time until it is the size of the circumference of a darning needle. The image should become brighter and more blurred due to overlapping light rays. If the hole gets too large, mask it with tape and start again.

Explain to the students that the cornea and lens of the eye bend the entering light rays and narrow them to focus on the retina. Note that at this point the picture is upside down, just as the students saw in the demonstration. The image is turned around in the brain and we "see" it right side up.

NOTE: Since you are performing this experiment in a dark room, remind students to be careful.