Pinhole Camera

Overview: Today you get to learn how to make a simple camera using equally simple materials. It's surprising how sharp the images appear when you do this experiment!

What to Learn: Although this might seem obvious, we see objects when light traveling from an object enters our eye. We can detect light in other ways (as you'll find out in a later lesson), but the eyes detect only visible light.

Materials

- box
- tracing paper
- razor or scissors
- tape
- tack
- meter stick

Experiment

1. Use a cardboard box that is light-proof (no leaks of light anywhere).
2. Seal light leaks with tape if you have to. Cut off one side of the box (Note – there's no need to do this if you're using a shoebox.)
3. Tape a piece of tracing paper over the cutout side, keeping it taut and smooth.
4. Make a pinhole in the box side opposite of the tracing paper.
5. Point the pinhole at a sunny window and move toward or away from the window until you see its image in clear focus on the tracing paper.
6. If you have a magnifying glass, place it in front of the pinhole to help sharpen the image.
7. Complete the data table by measuring your camera with the meter stick.

Pinhole Camera Data Table

Measure:	Length (inches, feet, cm, or…?)
Box length (this is one dimension of the screen)	
Box width (this is the other screen dimension)	
Box height (this is the distance from the hole to the screen)	
Distance from hole to the window (or candle) when focused	

Draw a diagram of your experiment, labeling the different parts and distances measured from above:

Reading

Light travels in a straight line; it comes through the window and into the hole in your camera. The rays of light cross as they enter the tiny hole, creating an inverted image that you see projected on the screen.

The biggest problem with this camera is that the inlet hole is so tiny that it lets in such a small amount of light and makes a faint image. If you make the hole larger, you get a brighter image, but it's much less focused. The more light rays coming through, the more they spread out the image and create a fuzzier picture. You'll need to play with the size of the hole to get the best image. You can also light a single candle in the middle of the room (instead of using a bright window) for the kids to use their camera. Just be careful they don't get too close – the cameras are flammable!

You can let your students go crazy taking actual photos with this camera by sticking on a piece of undeveloped black and white film (use a moderately fast ASA rating if you can still find it), but I recommend using tracing paper and a set of eyeballs to view your images.

OPTIONAL: You can hold up a magnifying glass in front of the pinhole to sharpen the image.

Exercises

1. How do the images appear when they're projected onto the paper inside your camera?

2. Why do you think it's important to make the box as light-proof as possible?

3. Is there a part of your body that works similarly to the pinhole?

4. Sketch a picture of something you saw through your pinhole camera.

Answers to Exercises: Pinhole Camera

1. How do the images appear when they're projected onto the paper inside your camera? (upside-down)
2. Why do you think it's important to make the box as light-proof as possible? (it allows only a small amount of light to pass through so that we can see the reflection better)
3. Is there a part of your body that works similarly to the pinhole? (our eyes)
4. Sketch a picture of something you saw through your pinhole camera.