**[Pinhole Camera Lesson Plan](http://www.curriki.org/xwiki/bin/view/Coll_mackzoore/PinholeCameraLessonPlan?bc=;Coll_mackzoore.PinholeCamera_0)**

**Introduction:**  The Pinhole Camera is a project-based activity.  Students will develop a basic understanding of basic optics and the workings of a simple camera.

**Timing:**  This activity should take about 180 minutes to complete.

**Group Size:** Partners (2)

**Learning Objectives:**

There are five objectives for this project.  They include:

**Build the camera** - This involves following the instructions stated below.

**Taking pictures** - This will require a sunny day or at least semi-bright light.

**Developing pictures** - This will usually happen immediately after you take the picture so you can see the results and change your methods accordingly.

**Photo collage** – Your top four photos will be presented.  Make sure to include a description of how each picture was taken and what can be seen.

**Reporting** - Your group must produce a one page, typed report that details the process of camera construction, picture taking, and picture development.  This report should be written in the passive, third person tense.  Attach the report to the back of the collage.

**Guiding Question:**  What is a pinhole cameral and how does it work?

**Materials:**  This project requires a shoebox, black duct tape, clear tape, black construction paper, aluminum foil, push pin, fast photographic paper, paper developer, and fixer. Have students bring their own shoeboxes, everything else can be found at a photo shop or a hardware store. The only difficulty will be finding a dark room.

Photocopy enough activity sheets for a pair of students to have one sheet.

**Procedures:**

The process of constructing the camera, loading the film, and taking the picture is pretty straight forward.  The students should have no trouble following the procedure.  The only mistakes tend to be:

-pinhole is too big

-box is not light tight

-exposed the film for too long

-moving the camera will it is taking the picture

-loading and unloading film in semi-dark room

Developing the film is a challenge.  You must have a dark room.  A closet can work, but you must seal the door.  Developing is a trial and error process.  Test a few of your own pictures out first and work out the kinks before students give it a try.

The report and collage will take some time to put together.  Assigning some of it for homework might be required.

The Pinhole Camera project is a partner based activity.  Students will need to work well together, follow instructions, and use their time wisely.  Partners will be grading each other at the end of the project, so if one student does not pull their weight, their grade will be reduced.

**Assessment:** The project will be assessed for camera construction, collage of picture, and project report. The provided rubric explains the details.

**Answer Key:**

Rubric is provided

# Optics Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Date: \_\_\_\_\_ Period: \_\_\_

# Pinhole Camera Project

**Introduction:** Today you will start the camera project. This is partnered activity, but groups of three are possible if there are an odd number of students in the class. After the project is completed you will be require to grade yourself and your partner. You’re your partner(s) grading of you will influence your overall grade on the project, so make sure work is equally distributed.

The project can be broken into the following stages:

* **Build the camera** - This involves following the instructions stated below.
* **Taking pictures** - This will require a sunny day or at least semi-bright light.
* **Developing pictures** - This will usually happen immediately after you take the picture so you can see the results and change your methods accordingly.
* **Photo collage** – Your top four photos will be presented. Make sure to include a description of how each picture was taken and what can be seen.
* **Reporting** - Your group must produce a one page, typed report that details the process of camera construction, picture taking, and picture development. This report should be written in the passive, third person tense. Attach the report to the back of the collage.

The camera will also be graded, so plan on turning it in with the collage.

**Safety First:** When building and developing you will be using sharp tools and dangerous chemicals. Use common sense and follow instructions safely.

**Materials:** shoebox, black duct tape, clear tape, black construction paper, aluminum foil, push pin, fast photographic paper, paper developer, and fixer.

**Instructions:**

***Part 1: Construction***

* Cut a 1.5-inch opening (circular if possible) into the side of your shoebox to form the lens opening.
* Cover all the seams, both inside and outside, in the box or can with black duct tape. Please don’t cover the whole camera in black tape!
* Use black construction paper to line the inside of the box completely, except for the lens opening.
* The box or can must be light-tight, so check the cover for looseness. Use tape or black paper to snug up the top, if necessary.
* Cut a 2-inch square piece of black duct tape. Cut a small hole, about the size of a pencil, in the center of the tape. Tape over a piece of aluminum foil.
* Using a pushpin make a small hole in the center of the aluminum exposed by the hole in the tape. Slowly twist the pushpin as it passes through the tape.
* Using the black duct tape, cover the lens opening with the tape /aluminum foil combo. Make sure all seams are taped shut.
* Make a shutter for the camera the same way you made the pinhole, except there should not be a hole. A shutter is basically a flap hinged with a piece of tape. Use a small piece of tape to hold the shutter closed before and after you take a picture.
* Make a viewfinder for the camera out of cardboard. The viewfinder consists of two parts; the front frame of the viewfinder should be same shape and slightly smaller than the film and located directly above the pinhole at the front of the camera, while the rear frame is a sighting peephole directly above the lid of the can and aligned with the center of the front frame.

***Part 2: Loading Film***

* Loading film must happen in a dark room, the photographic developing type or literally a dark room. Photographic paper is sensitive to light, so anything other than a completely dark room will expose the film. You may work by the light of a flashlight covered with several thicknesses of red cellophane paper if it is placed 6 to 8 feet away.
* To load the photographic paper, open the box and tape the paper into the back of your camera, opposite the pinhole. The shinny side should be facing the pinhole. Use normal tape to attach the paper.
* Close your shoebox and using the black duct tape, tape around the box top to ensure that it is light-tight.

***Part 3: Taking Pictures***

* Here is where the fun begins…
* Find an image that you would like to capture.
* Line up your camera using the viewfinder.
* One team member holds onto the top of the camera, ensuring that it doesn’t move. Moving cameras produce blurry images.
* When the camera is secured, the other group member will open the shutter for 10-15 seconds. 10 if it is bright and sunny and 15 if it is indoors.
* Close the shutter securely. Any extra light will ruin your picture.

***Part 4: Developing Film***

* Developing film must also happen in a dark room. Once again, this could be a photographic developing room or literally a dark room using flashlight covered with several thicknesses of red cellophane paper if it is placed 6 to 8 feet away.
* Put your exposed photographic paper into a tray of paper developer. Be sure you completely cover the paper with the developing chemical. Agitate it by gently rocking the tray back and forth. You need to develop the paper for at least 1 minute.
* Next, put the paper into another tray with water to stop the development.
* Next, put the paper into a tray of fixer. Be sure you completely cover the paper with the fixer. Agitate it by gently rocking the tray back and forth. You need to fix the paper for at least 4 minutes.
* Next, put the paper into one last tray with water.
* Put the picture somewhere to dry. Be sure that you don't touch it until it completely dries, because it will be tacky while it's drying and if you touch it, it will leave marks.



