H

Po Kok Primary School

General Studies

Science Day

A Pinhole Camera

P.5 (A)

Name: Harry

Task

You are being selected as our school photographer on speech day. Now, you have to design a pinhole camera to show your understanding of the theory of reflection.

Learning Objectives

- Understand the organization and function of a pinhole camera and a normal camera.
- Investigate the factors that affect the images of the pinhole camera.
- Develop your scientific mind and creativity, use simple materials to make your own pinhole camera.
- Solve problems critically and try to think from different dimensions.

Acquired Knowledge

- Light travels in a straight line.
- Light is reflected on plane surface.
- The characteristics of plane mirror.
- Different kinds of mirrors and their uses.

Self-Learning Area

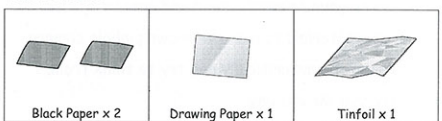
Here are some websites about pinhole camera. Please go to these website and read the passages at home!

The definitions of pinhole camera	http://en.wikipedia.org/wiki/Pinhole_camera
Constructing a pinhole camera	http://www.pinhole.cz/en/pinholecameras/whatis.html
History of pinhole camera	http://photo.net/learn/pinhole/pinhole

Requirements

You can make a pinhole camera with the materials provided.

Materials



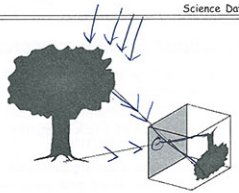
Learn more about pinhole camera

A pinhole camera is the simplest camera possible. It consists of a **light-proof box**, some sort of **film** and a **pinhole**. The pinhole is simply an extremely small hole like you would make with the tip of a pin in a piece of thick aluminum foil.

A pinhole camera works on a simple principle. Imagine you are inside a large, dark, room-sized box containing a pinhole. Imagine that outside the room is a friend with a flashlight, and he is shining the flashlight at different angles through the pinhole. When you look at the wall opposite the pinhole, what you will see is a small dot created by the flashlight's beam shining through the pinhole. The small dot will move as your friend moves his flashlight. The smaller the pinhole (within limits), the smaller and sharper the point of light that the flashlight creates.

Now imagine that you take your large, dark, pinhole-equipped room outside and you point it at a nice landscape scene. When you look at the wall opposite the pinhole, what you will see is an **inverted** and **reversed** image of the scene outside. Each point in the scene emits light, and, just like the flashlight, the beam of light from that point passes through the pinhole and creates a point of light on the back wall. All of the points in the scene do that at the same time, so an entire image, in focus, is created on the back wall of the room. The image is very dim because the pinhole is so small, but you can see it if the room is very dark.

A pinhole camera is simply a smaller version of that room, and the **film** inside the camera replaces you. The film records the image that comes in through the pinhole. The camera records a nice, in-focus image of the scene that you point the camera at. Usually, you have to expose the film for a long time because the pinhole lets so little light through.



The pinhole in a pinhole camera acts as the **lens**. The pinhole forces every point emitting light in the scene to form a small point on the film, so the image is crisp. The reason a normal camera uses a lens rather than a pinhole is because the lens creates a much larger hole through which light can make it onto the film, meaning the film can be exposed faster.

Questions:

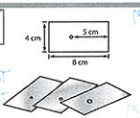
1. What is the characteristics of the image formed in the pinhole camera?

   The image formed in the pinhole camera is inverted.

Steps

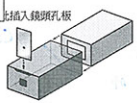
1. Design the outlook of your pinhole camera.
2. Construct your pinhole camera with the materials given.
3. Turn off the light and look at the objects outside to test if the images are clear.

First



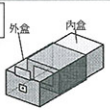
Measure the size according to the size of your box, make 3 holes on 3 tinfoil paper .

Second



Select one tinfoil paper and put it in the camera.

Third



Put the inner box into the outer box. Look through the pinhole and adjust the position until the images are clear.

Results

Test	Viewing objects	Distance	Put a ✓ if the images are clear	If images are unclear, please estimate the reasons
1	PE Door	10m		Too far,
2	Temple Entrance	15m		Too far, Too dark
3	Basketball Hoop	10m		Too dark
4	~~Temp~~ Red gate	100m	✓	Clear,
5	~~Temple lion~~ Temple lion	15m		Too dark
6	Rubbish ~~gate~~ bin	12m		Too dark

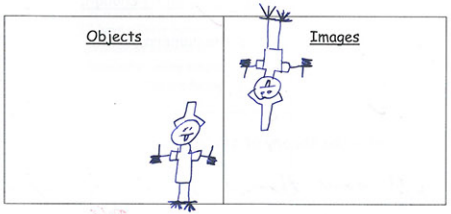
Through making and testing the camera, we discover that

we need a lot of light ~~to~~ to see objects through the pinhole and it can't be too far.

Critical Thinking Zone

1. The images are vertical or the other way round? Please draw the images.

The other way round



2. What are the reasons that affect the results of the images?

~~Too dark~~, ~~too big~~ pinhole, the size of the and the amount of light around the images.

3. How to improve the design of your camera so as to capture clear images?

- Materials used and colour of the camera?

Black to absorb the light ~~and tinfoil~~

➢ The size and shape of the pinhole?

The pinhole carmera should be (bigger / smaller). The shape should be ~~or circular~~ circular / a circle.

➢ The distance between the hole and the back side?

The distance should be (long / short) enough.

➢ Apart from the hole, is the camera totally blackened?

(Yes / No)

4. Describe the theory of the camera.

Light goes through the pinhole and form ~~a~~ an inverted image ~~into~~ onto ~~through~~ the drawing paper.

5. What did you learn from this experiment?

Smaller pinhole improves the clearness of the image, pinhole camera ~~flips~~ makes the image inverted.

6. How could you solve your problem during the experiment?

More sunlight and a smaller pinhole.

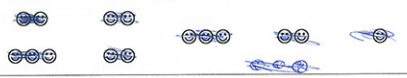
Self Assessment

Area	Keys	Well Done	Quite Good	Need Improvement
Knowledge	I understand the operation principle of a pinhole camera	✓		
	I understand the factors that affect the working of a pinhole camera	✓		
Technique	I have a lively learning and use of scientific knowledge, using simple materials for producing pinhole camera	✓		
	I can analyse the operation of a pin-hole camera and think of ideas to improve	✓		
	I can improve the design of pin-hole camera	✓		
	I can show my creative thoughts	✓		
Attitude	I can complete the work seriously and actively participate	✓		
	I can listen to and accept the views of others	✓		
	I can seek help from teachers	✓		

Encourage yourself : I helped a lot and understood ~~understanded~~ the concept of a pinhole camera.

Peer Assessment

His/Her performance on this activity :



Encourage your classmate : Very creative ideas, smarter ~~girl~~ student helped a lot.

✓

Parents' Assessment

Area	Keys	Well Done	Quite Good	Need Improvement
Attitude	Complete the work seriously and actively participate	✓		
	Listen to and accept the views of others	✓		
	Willing to learn from others	✓		
	Creativity	✓		

Encourage your kid :

Parents' signature: _____

Teacher's Assessment

Area	Keys	Well Done	Quite Good	Need Improvement
Knowledge	The operation principle of a pinhole camera	✓		
	The factors that affect the working of a pinhole camera	✓		
Technique	Lively learning and use of scientific knowledge, using simple materials for producing pinhole camera	✓		
	Analyse the operation of a pin-hole camera and think of ideas to improve	✓		
	Improve the design of pin-hole camera	✓		
	show his/her creative thoughts	✓		
Attitude	Listen to and accept the views of others		✓	
	Work seriously	✓		
	Actively participate	✓		

Encourage your pupil : Score: 10 / 10

Sometimes appear to be saving towards others. Harry can analyze the experiments using his own ideas and scientific knowledge. An outstanding student any teacher would dream to have in their classes.

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