

Po Kok Primary School



General Studies
Science Day
A Pinhole Camera
P.5 (B)

Name: Kirin (A)





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

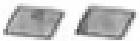
Here are some websites about pinhole cameras. Please go to these websites and read the passages at home!

The definition of pinhole cameras	http://en.wikipedia.org/wiki/Pinhole_camera
Constructing a pinhole camera	http://www.pinhole.ca/en/pinholecameras/a.html
History of pinhole cameras	http://iphoto.net/learny/pinhole/pinhole.htm

Requirements

You can make a pinhole camera with the materials provided.

Materials

		
Black Paper x 2	Drawing Paper x 1	Tinfoil x 1
		
Tape x 1	Scissors / cutter	



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 cameras 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:

- What are the characteristics of the image formed in the pinhole camera?

1. The image is very small. They are of the same size as the object.



Steps

- Design the outlook of your pinhole camera.
- Construct your pinhole camera with the materials given.
- Turn off the light and look at the objects outside to test if 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	the girl	5 m.	✓	
2	book	25 cm.	✓	
3	copying pen	10 m.	✗	Because the camera is far away from the object.
4	white box	5 m.	✗	Because the camera is far away from the object.
5	yellow wall	1 m.	✗	Because the camera is far away from the object.
6	object	3 m.	✓	

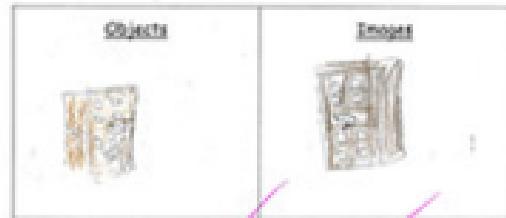
Through making and testing the camera, we discover that

Strong sunlight caused the image blurry.

Critical Thinking Zone

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

Other way round



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

Strong sunlight

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

➢ Materials used and colour of the camera?

Black paper, white, shiny paper, colour, cutter and sellotape

- > The size and shape of the pinhole?

The size of the hole does not

- > The distance between the hole and the back side?

The distance should be long enough to fit the eye in between

- > Apart from the hole, is the camera totally blocked?

No

4. Describe the theory of the camera.

In theory, light will be reflected by the screen

5. What did you learn from this experiment?

We know that the pinhole cameras make real images

because it is because in our eyes every thing we see is due to

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

I add some brighter light from outside and the lens will open

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 cameras.	/		
	I can analyse the operation of a pinhole camera and think of ideas to improve.		/	
	I can improve the design of pinhole cameras.		/	
	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 : Do better next time

Peer Assessment

His/Her performance on this activity :



Encourage your classmate : *Good job! Kira.*

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 : *Well done! Very happy!*

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	Understand and use of scientific knowledge, using simple materials for producing pinhole cameras		✓	
	Analyze the operation of a pinhole camera and think of ideas to improve		✓	
	Improve the design of pinhole cameras	✓		
	Show higher creative thoughts		✓	
Attitude	Update to and accept the views of others	✓		
	Work seriously		✓	
	Actively participate	✓		

Encourage your pupil : Score: **76 / 10**

You can do it better if you work seriously. Keep trying!

