# LET'S STUDY LIGHT

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Subject: Science
Students: Primary year 6
School: CEIP "Narciso Alonso Cortés" Valladolid

# METODOLOGÍA

Siguiendo el método constructivista, realizamos a los niñ@s diversas preguntas sobre la luz, y a través de diferentes experimentos tratamos de dar respuesta a dichas preguntas.

Repetimos los experimentos, analizamos los resultados, construimos un modelo y finalmente sacamos una conclusión que explique los resultados obtenidos .

# OBJETIVOS

A través de diversas preguntas, trataremos de conseguir los siguientes objetivos:

- Clasificar los objetos en transparentes, translucidos y opacos.
- Descubrir cómo se producen las sombras.
- Explicar por qué varía el tamaño y la forma de las sombras.
- Entender las fases de la luna.
- Demostrar que la luz viaja en línea recta y a una gran velocidad.
- Entender que la luz está formada por pequeñas partículas de materia llamadas fotones.
- Descubrir los colores que forman la luz blanca.
- Mezclar los colores que forman la luz blanca para descubrir qué colores forman sus combinaciones.
- Entender el funcionamiento del ojo.

# Can light go through all kind of objects?

Experiment: POWERFUL LIGHT

You will need:

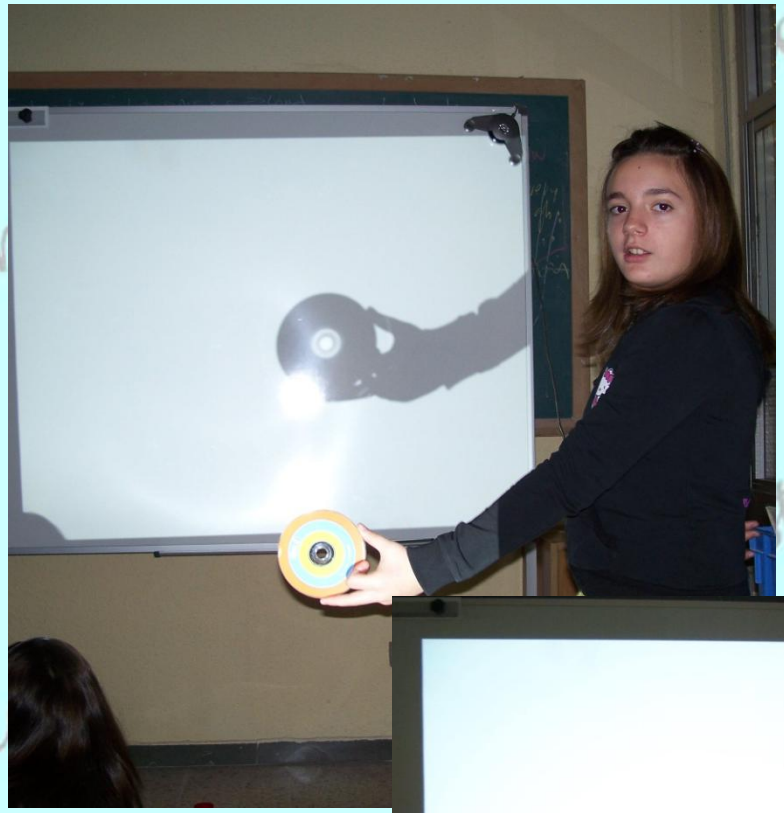
- A torch
- Several objects made up of different materials.

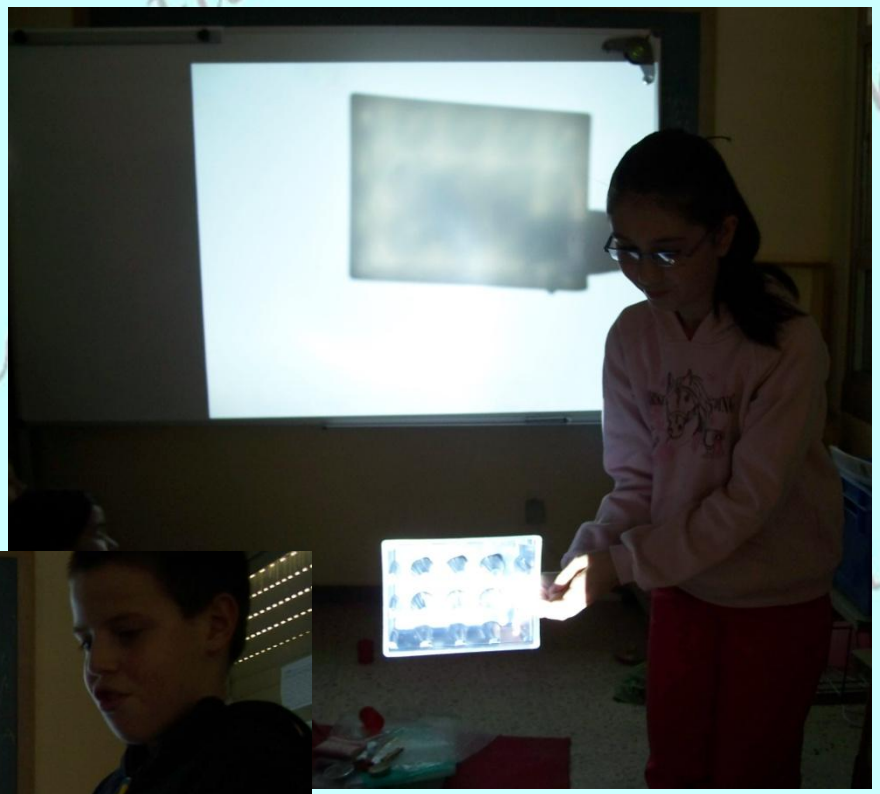
Instructions:

1.- Collect several objects made up of different materials.

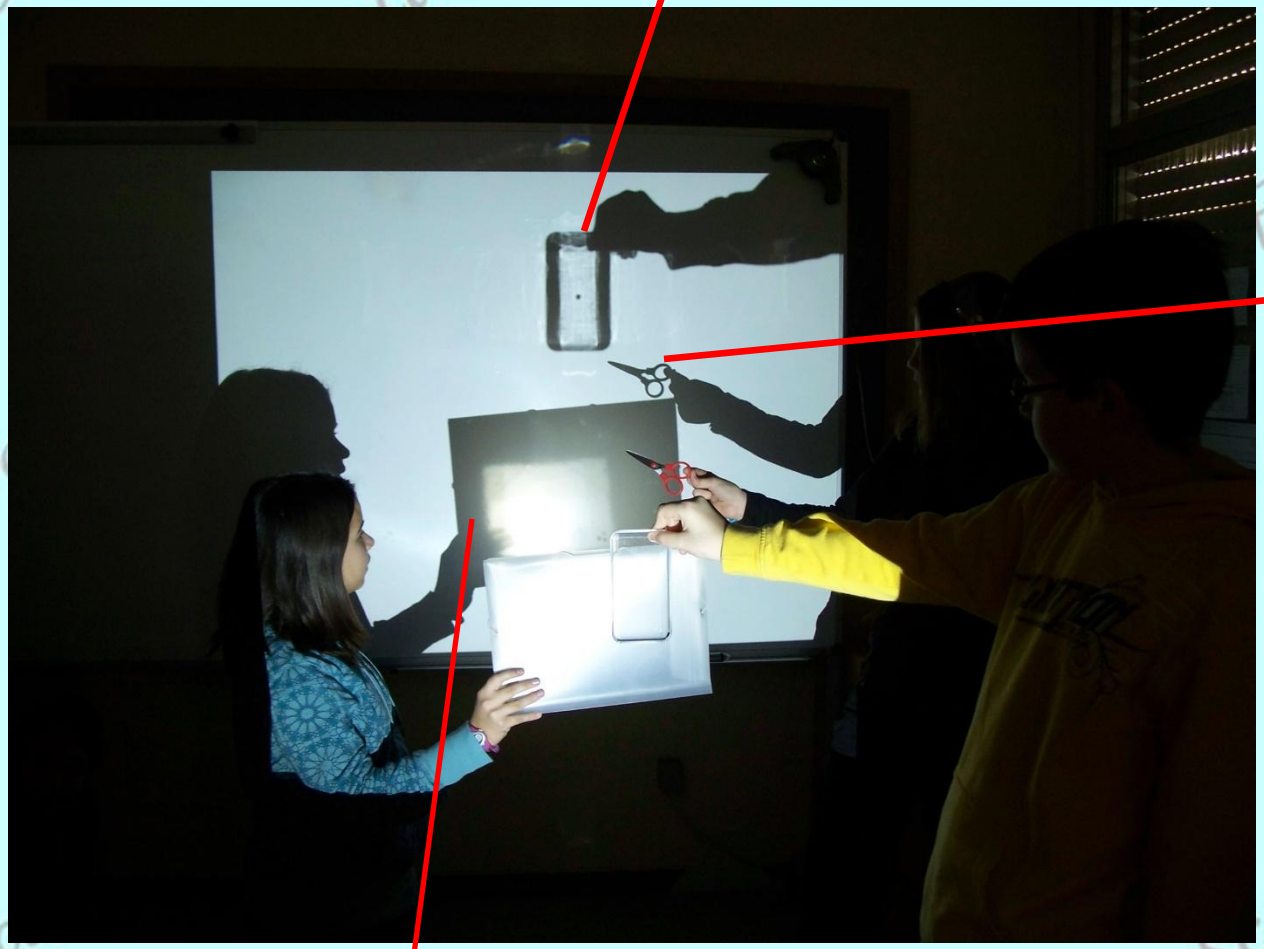
2.- Hold the objects in front of the light one by one.

3.- Classify the objetcs depending on the quantity of light they let pass through.





The jar lets the light go through it.



Scissors don't let the light go through it.

The plastic folder lets go a little bit of light through it.

We can classify objects in three groups, depending on how much light can go through them.

## Transparent objects

## Translucent objects

## Opaque objects

# EXPERIMENT RECORD SHEET

Name: Maria Santiago Class: 6ºA Date: 2-2-10

EXPERIMENT: Experiment III : Powerful light

I Will need:

- A torch
- Several objects made up of different materials.

Instructions:

1- Collect several objects made up of differents materials.

2- Hold the objects in front of the light one by one.

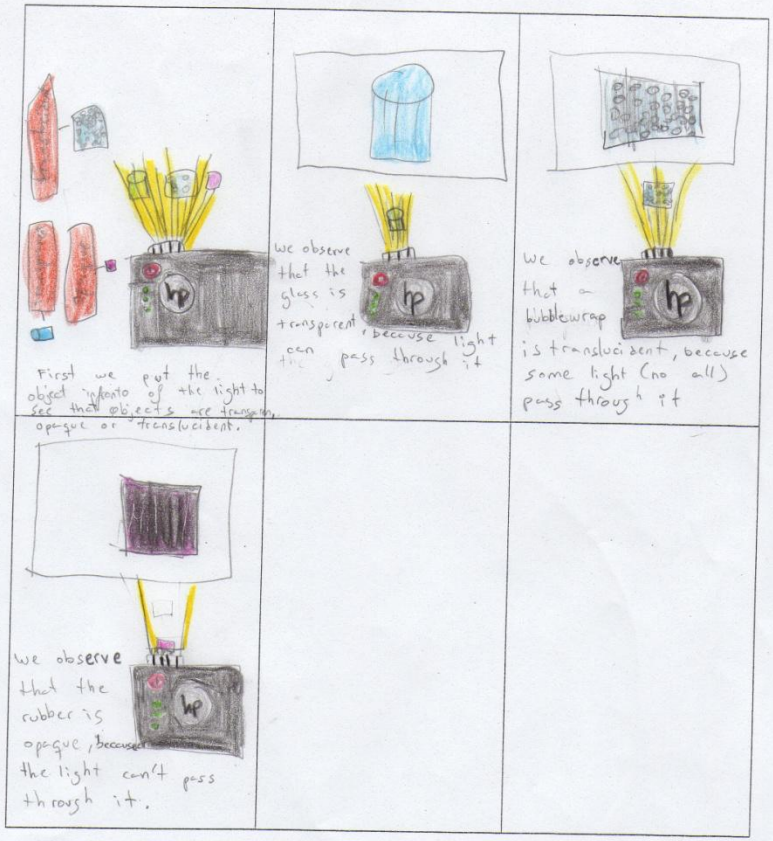
3- Classify the objects depending on the quantify of light they let pass through.

Relevant words:

quantify, opaque, traasluceent and transparent

Paula Barro Criado 6ºA
1 / 2 / 2010

Process:(draw and write)

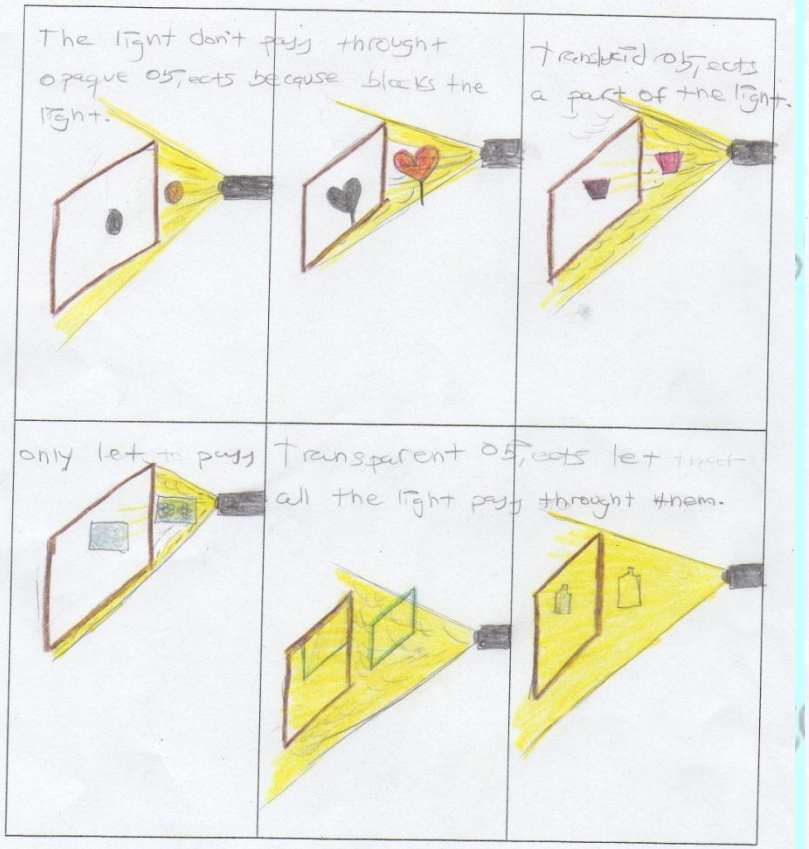



Conclusion:

- Light can pass through transperent objects.
- Light can't pass through opaque objects.
- Some light can pass through translucident objects, but no all the light.

Pablo Oviedo Pastor

Process:(draw and write)

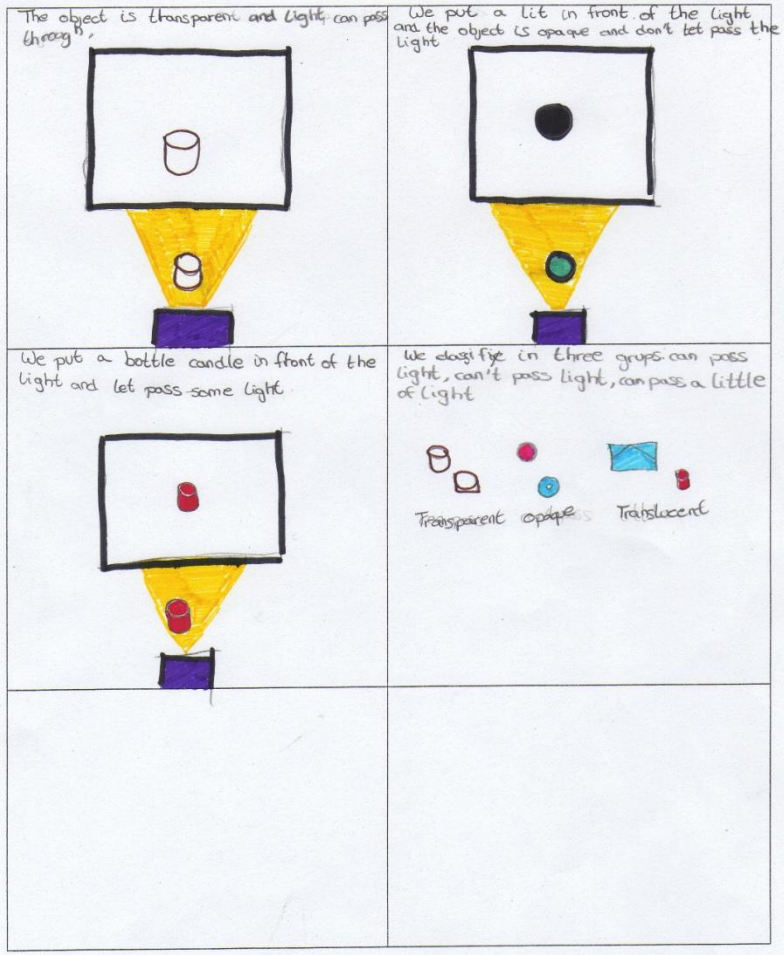



Conclusion: 1. Transparents objects let all the light pass through them.
2. Light can't pass thrugh opaque objects because they block the light.
3. Translucent objects only let pass a part of the light, but not all of them.

7

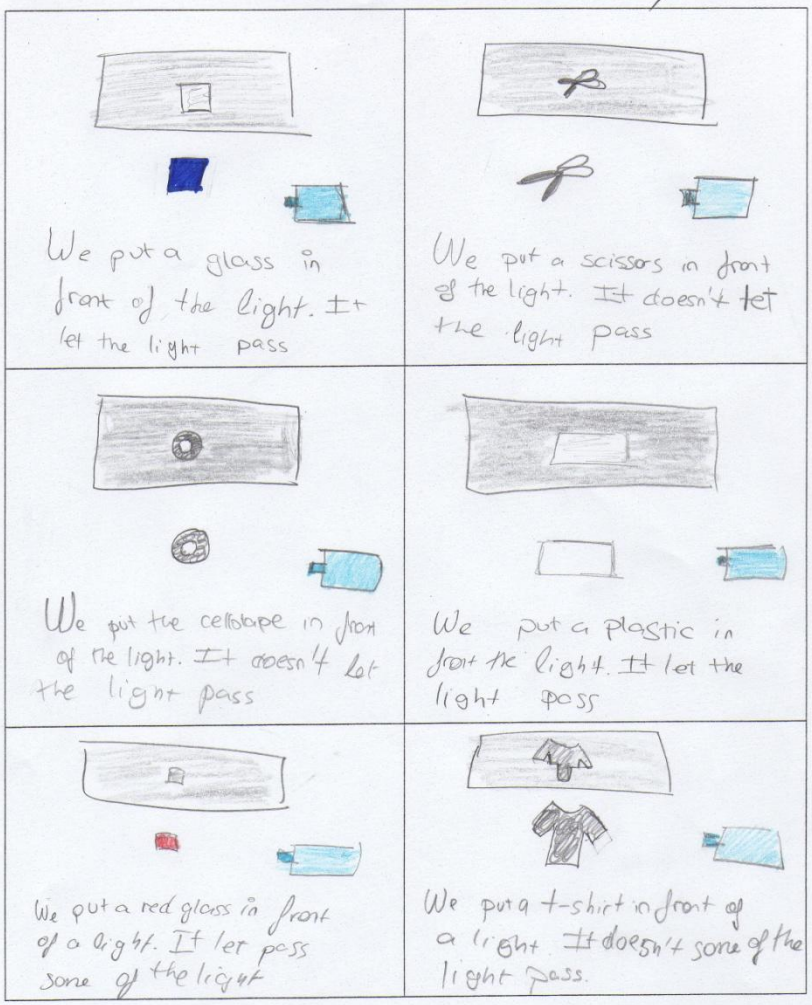
Sandra García 6ºB

Process:(draw and write)




Conclusion: That some objects that are transparent and light pass
Some objects let pass a little bit of light
Some objects don't let pass the light.

Process:(draw and write) Andrea Suñén 6-B




Conclusion: The transparents objets let the light pass through them and the opaque objects doesn't

Translucent object let pass some light

CONCLUSION: Some objects don't let light go through them, they are OPAQUE.

Some objects let a little bit of light go through them, they are TRANSLUCENT.

Some objects let all the light go through them, they are TRANSPARENT.

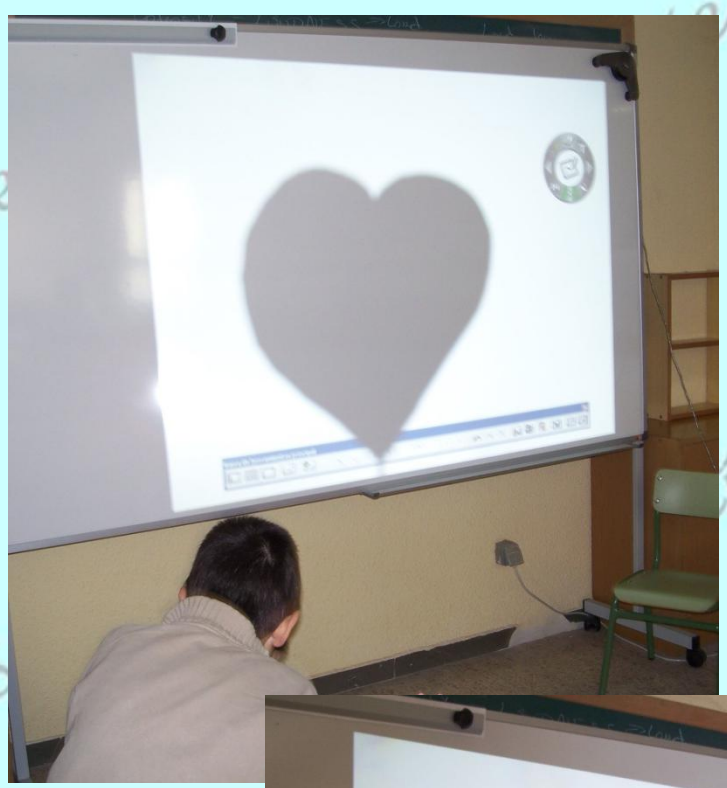
# How are shadows produce?

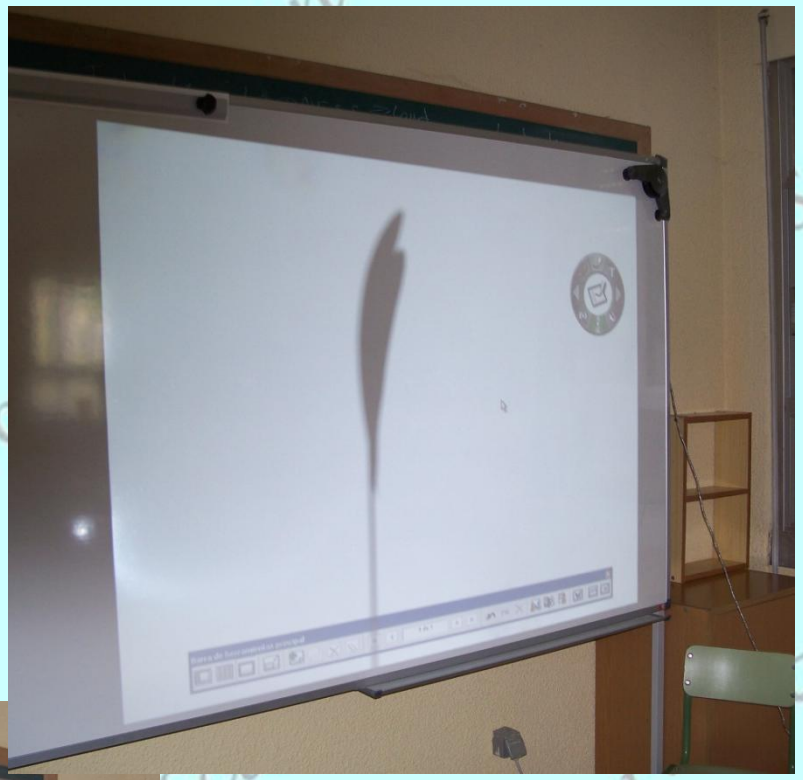
Experiment: PLAYING WITH SHADOWS

You will need:
- A piece of card
- Cello tape
- A stick
- Scissors

Instructions:
1.- Cut out a shape from a piece of card.
2.- Fix it with cello tape to the end of a stick.
3.- Try holding the shape close to the light and then further away.

CONCLUSION: The shadow is produce when the object blocks the light





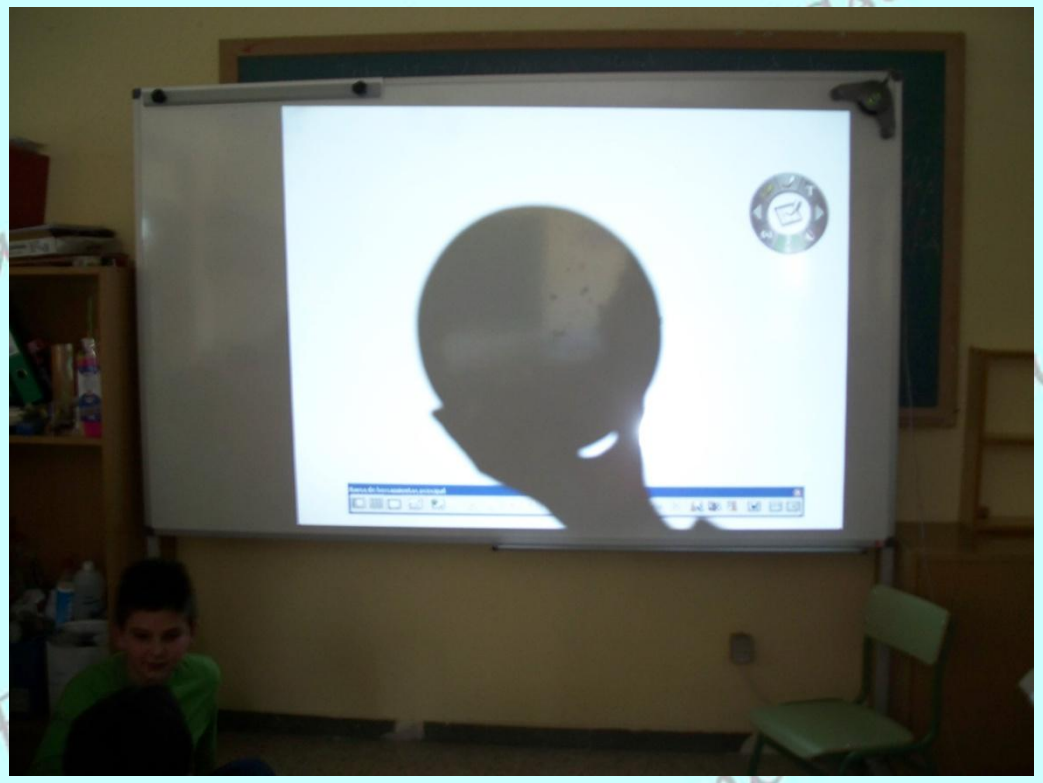
CONCLUSION: The shadow changes its shape when we turn the object round.

# Does the shadow change?

CONCLUSION: The shadow is bigger when the object is nearer the light because it blocks more light.

# Let's try with a ball

What can you observe about the shadow of a ball?

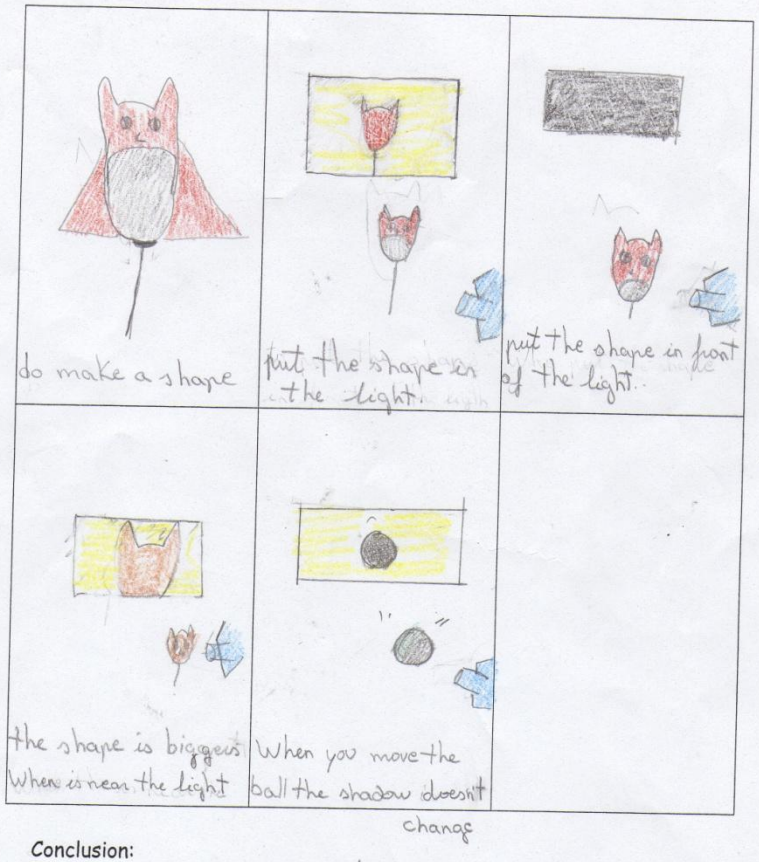


CONCLUSION: The shadow of a ball doesn't change its shape when we turn the ball round.

# Worksheets we have done

Andrea 6ºA

Process:(draw and write)




Conclusion:

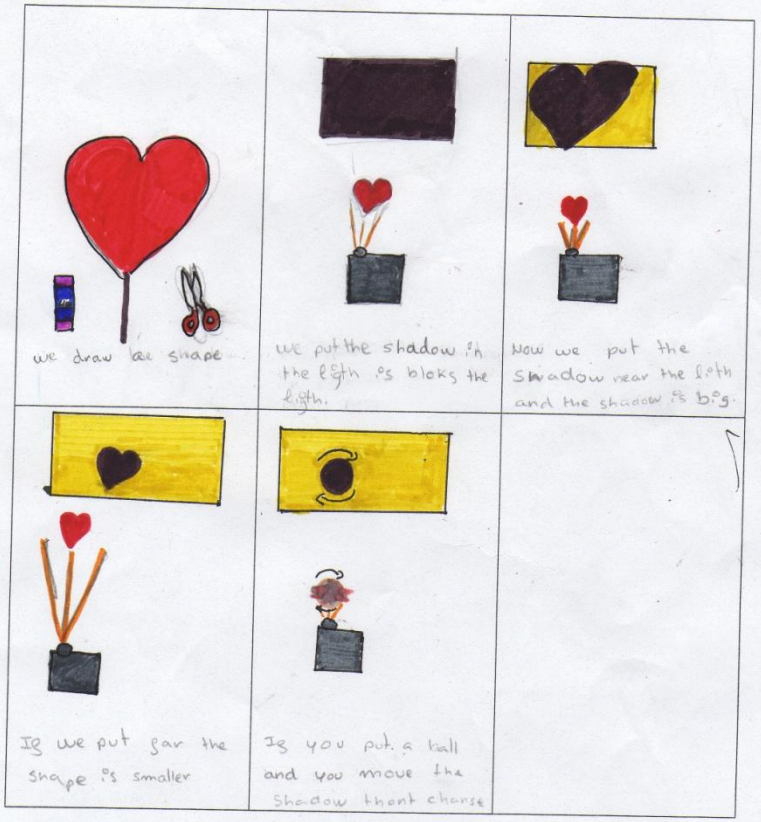
1º the shape bloks the light.

2º the Shadow is biger when the shape is near the light because is block more light.

3º tha shadow of a ball doesn't change

Esther Rodríguez 6ºA

Process:(draw and write)




Conclusion:

1 the shape bolks the ligth.

2. the shadow is birger when the shape is near the ligth because is blocks more light.

3. the shadow of a ball thon't change

# Why does the Moon keep changing its shape ?

Experiment: LET'S ACT LIKE THE SUN, THE EARTH AND THE MOON

You will need:
- A torch
- A white ball

Instructions:

1.- Hold the ball up in front of the torch.

2.- Turn round slowly with the ball in your hands.

3.- Observe the reflected light on the ball.

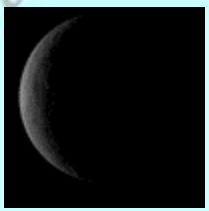
From the Earth, we can see the reflected light on the Moon as a complete circle.

Now, the illuminated area we can see is a semicircle. The Moon is getting smaller and smaller.

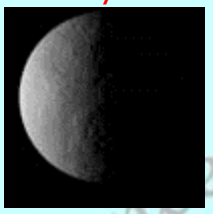
Then, we can't see the Moon because the light from Sun arrives at the other side of the Moon

A few days later, the Moon appears in the sky and we can see it as a semicircle again. The Moon is getting bigger and bigger.

Waning crescent
Day 25



Last quarter (Half Moon)
Day 21

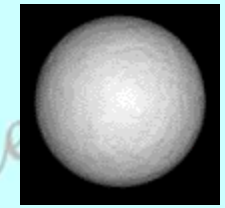


Waning gibbous
Day 17

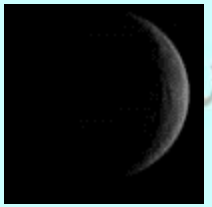
Sun

New Moon
Day 0

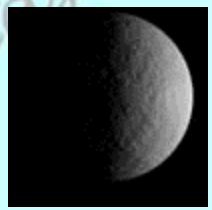
Full Moon
Day 14



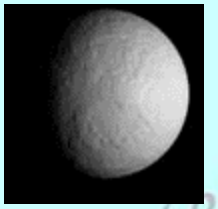
Day 3
Waxing crescent



Day 7
First quarter or Half Moon



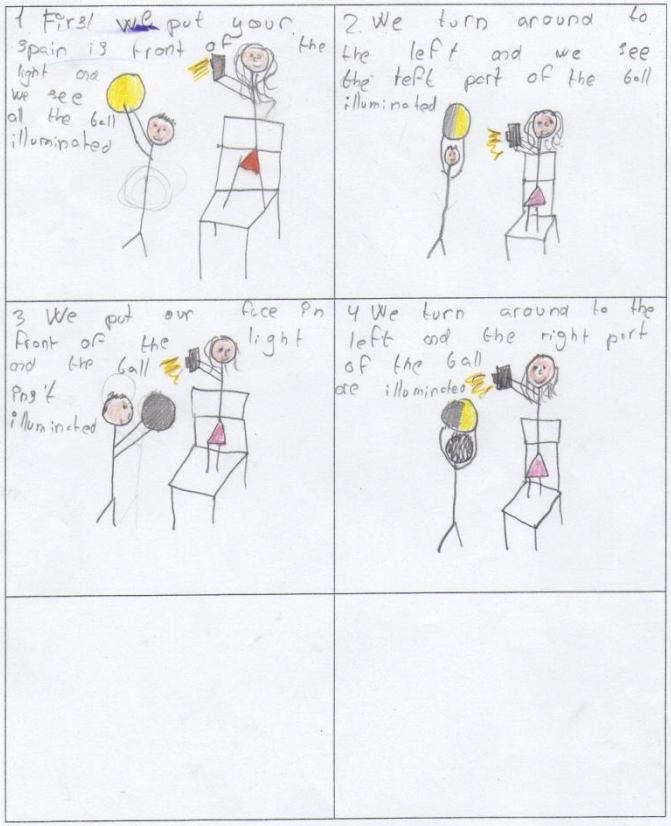
Day 10
Waxing gibbous



CONCLUSION: The moon is illuminated because it reflects the light from the sun. The part of the moon facing the sun is lit up. The part facing away from the sun is in darkness.

Cristina Soriano 6ºA

Process:(draw and write)



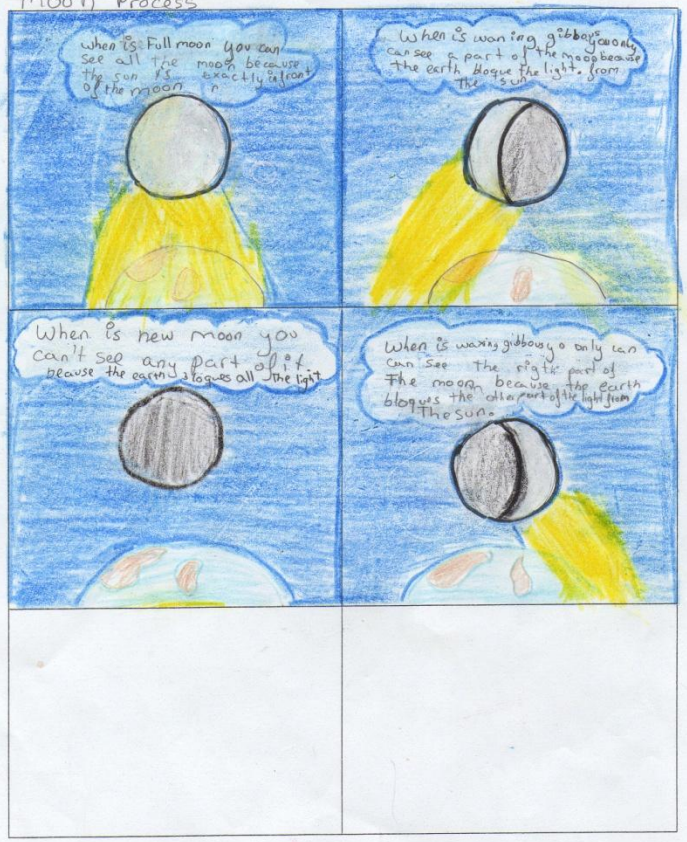

Conclusion:

the changing shape of the bright part of the moon that we see is called its phase

Amanda Rodriguez

Process:(draw and write)

moon Process




Conclusion:

The changing shape of the bright part of the moon that we see is called its phase.

The changing shape of the bright part of the Moon that we see is called its **phase**.

# Let's make our model of shadows

Imagine that light is like a sand blast. If we put the shape of an object on the floor and we throw a sand blast over it, we will see a space without sand, this space has the same shape than the object.

We can say that light is like the sand blast, the space without sand is like the shadow produced by light.

# How does light travel?

Experiment: SPEEDY LIGHT

You will need:
- A straw
- A stick

Instructions

1.- Look at an object through a straw.

2.- Fold the straw.

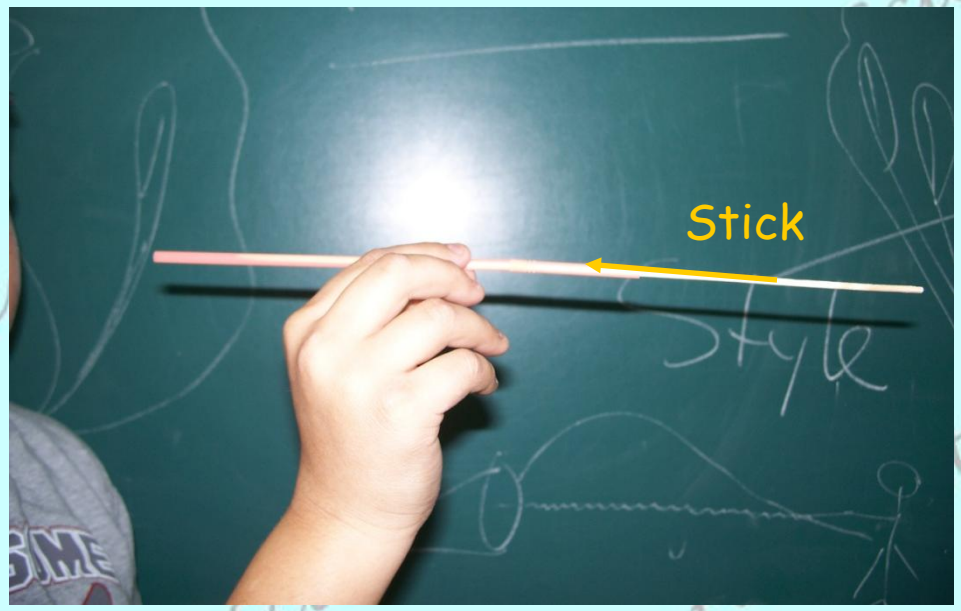
3.- Look through the folded straw at the object again.


We can see the object when the straw isn't folded.


We can't see the object when the straw is folded.

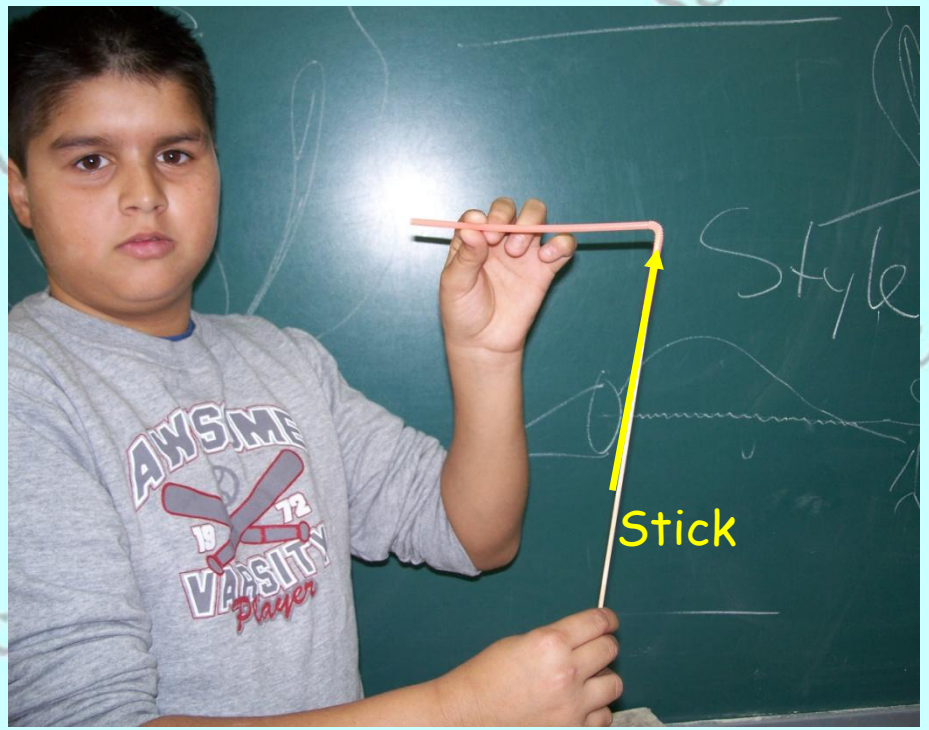
# Why?

# Let's make our model to explain how light travels





The light, the same as the stick, can pass through the straight straw and it reaches our eye.

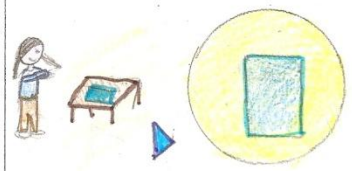




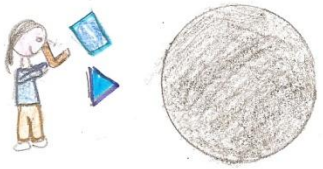
The light, the same as the stick cannot bend, so it cannot reach our eyes and we can't see the object.

Andrea 6°A

Process:(draw and write)



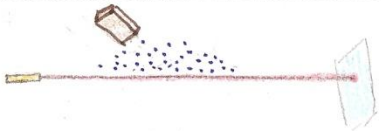
When you look with the holl of the strow you look the object



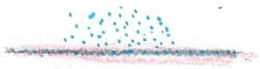
When you bend the strow look the holl and you don't see nathing.

the ligth don't pass because the strong is bend.

But when the strow is straigth the light pass.



through the Powder Flour with the laser beam and you see the beam



You can see the beam because the Powder Flour reboun with the beam

Conclusion:

the light don't pass with the strow ben because the light don't ben.

CONCLUSION: Light travels in straight lines.

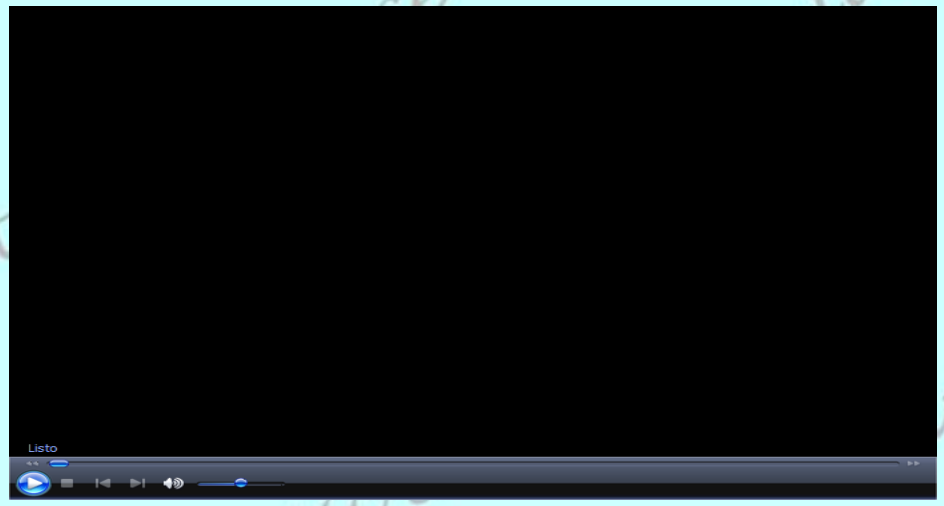
# How fast does light travel?

The students carry out an investigation looking for this information.

And this is what they have found:

About 300,000 kilometres per second, so light from the Sun takes about 8 minutes to travel 149 million kilometres and reach the Earth.

If you could drive to the sun at 100 kph, it would take you 177 years to get there! In one second, light can go around the earth 7 times!



# What is light made of?

Experiment: SEEING LIGHT

You will need:
- A laser beam
- Two mirrows
- Some solid as talcum powder, cocoa, salt, bicarbonate and flour.
- Some water.
- A paper and a litter.

Instructions:

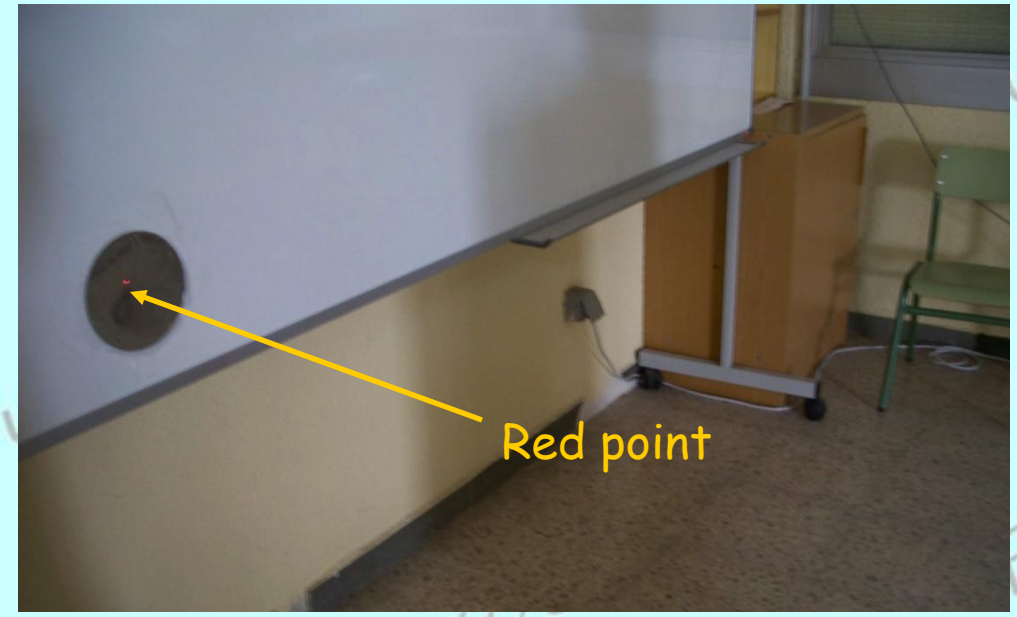
1.- Point the laser to a mirrow.

2.- Throw over some talcum powder.

3.- Observe what happens.

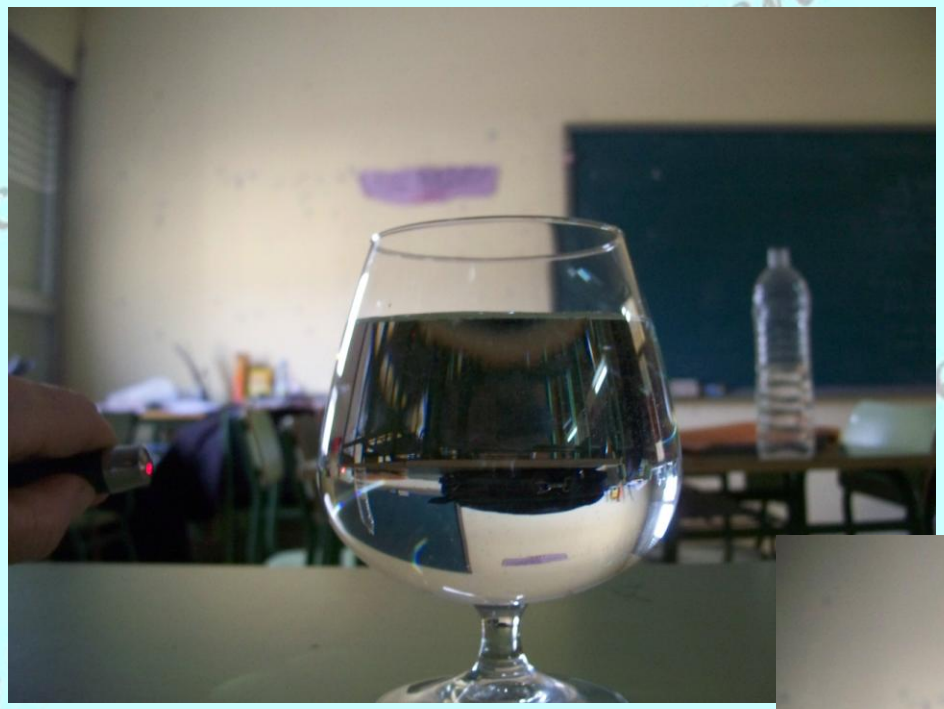
4.- Try to do the same with other solid and liquid substances.

5.- Burn a piece of paper and point the laser beam to the smoke.



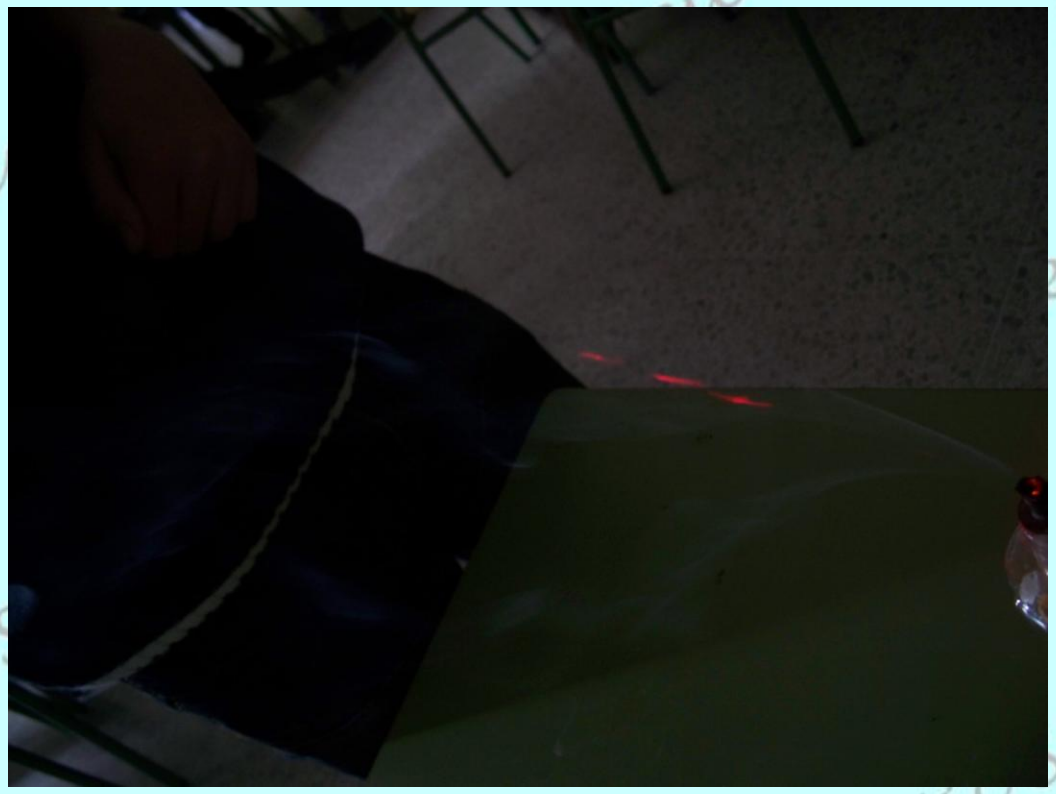

We can't see the ray through the air, we only see a red point reflected on the mirrow.

Through the talcum powder we can see the way of the ray.



We can't see the way of the ray through clean water.

We can see the way of the ray through a mixture of water and talcum powder.

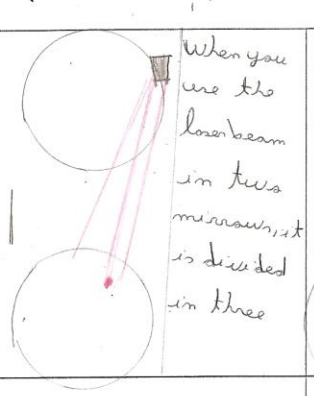


We can see the ray through the smoke.

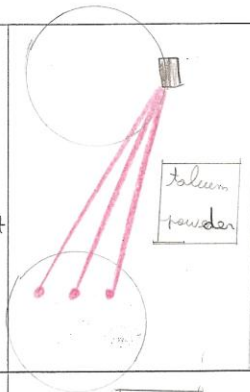
CONCLUSION: If we can't see the way of the light through air and clean water it is because they are made up of very tiny particles, but when we put bigger particles along the way of the light, it hits and reflects on each particle and we can see it. So **Light is made up of small particles called PHOTONS.**

Eduardo Mulero 6ºA

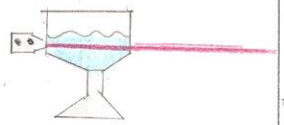
Process:(draw and write)



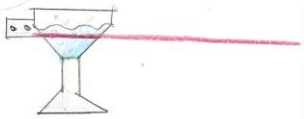
When you use the laser beam in two mirrows, it is divided in three




When you use the talcum powder in the laser beam, the three reflexes you see



When you switch off the light, you can see the laser beam in the water.



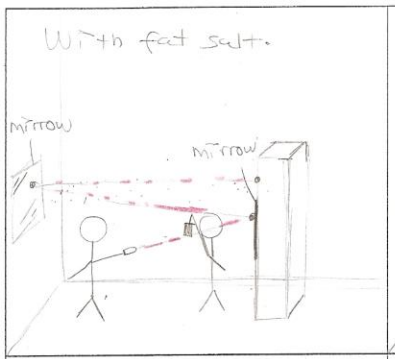
When you put talcum powder in the water you can see the laser beam

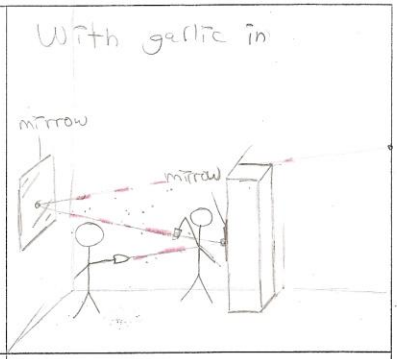
Conclusion: We can see the laser beam because light is made up of particles, called Photons. When photon hit particls bigger. Then then we can see the ~~light~~ reflected light on the particles.

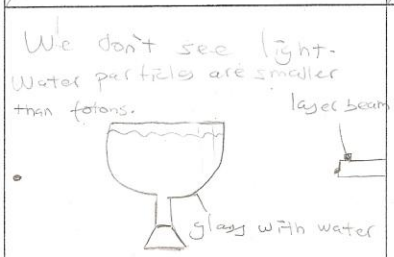
1-1

Pablo Oviedo 6A Tuesday, 9th February, 2010

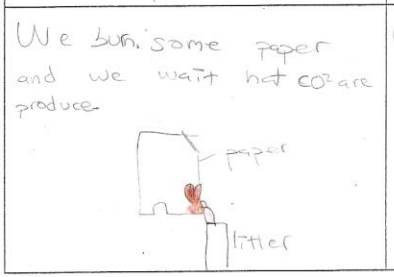
Process:(draw and write)

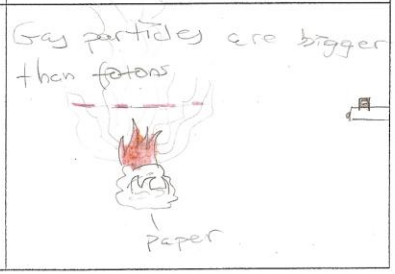






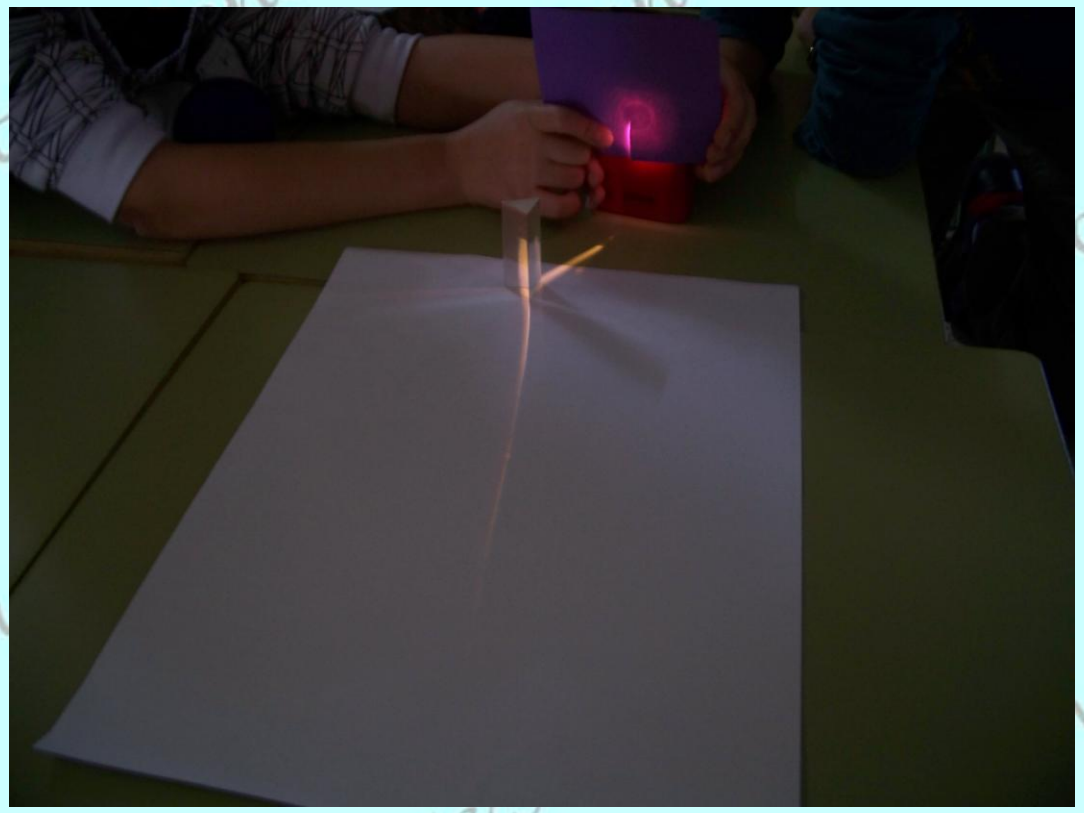




Conclusion: We can see the laser beam because light is made up of particles called fotons. When photons hit particles bigger than them we can see the reflected light on the particles

# Is white light really white?

Experiment: RAINBOW

You will need:
- A piece of card
- Scissors
- A glass of water or a prism
- A sheet of white paper
- A torch



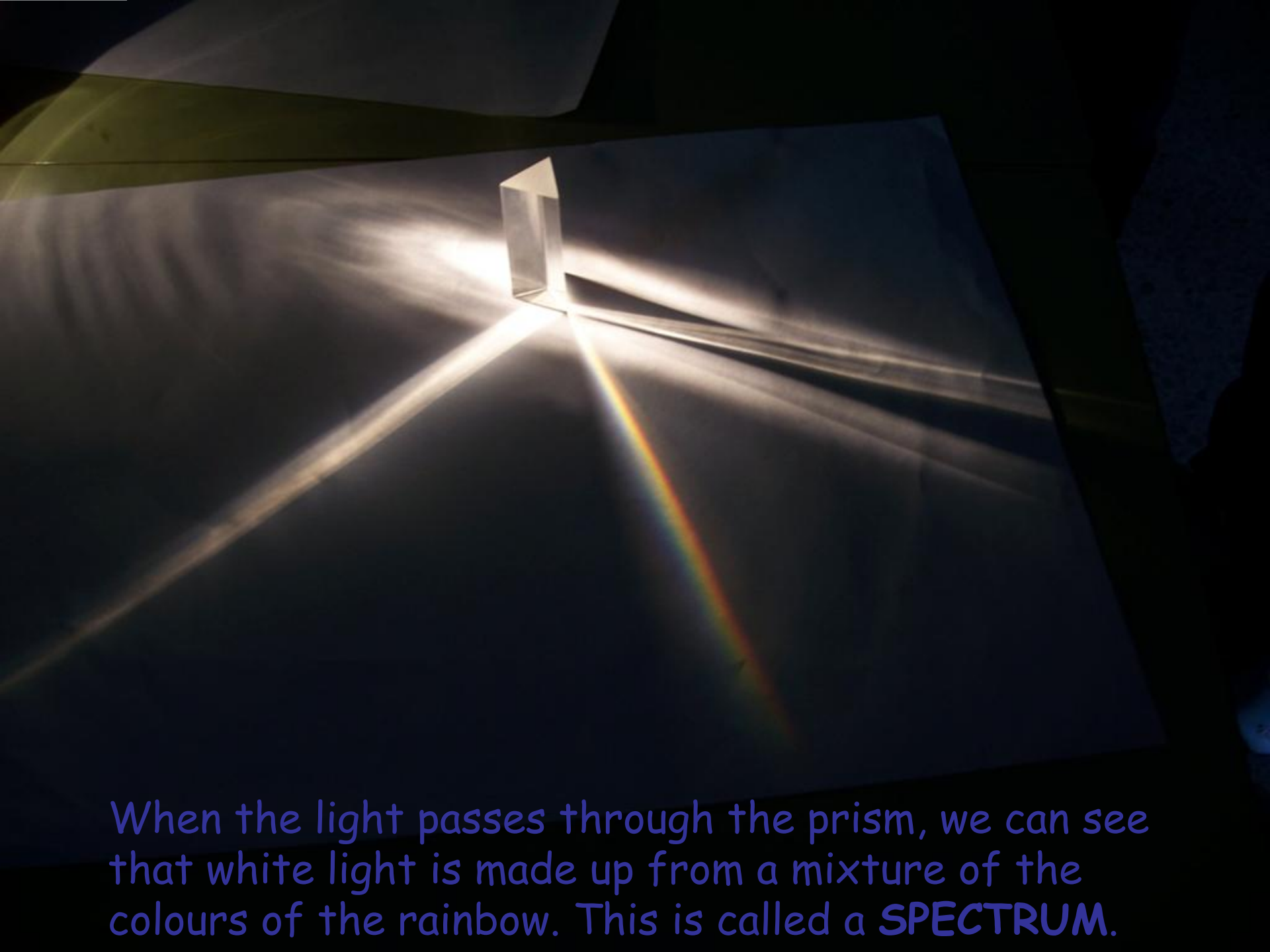
Instructions:

1.- Cut a slit in the card.

2.- Hold it up against a torch.

3.- Put the prism or the glass full of water in front of it.

4.- Put the sheet of white paper under the prism or the glass of water.



When the light passes through the prism, we can see that white light is made up from a mixture of the colours of the rainbow. This is called a **SPECTRUM**.

# Let's put together the colours of the rainbow.

Experiment: WHITE LIGHT?

You will need:
- A piece of white card.
- Scissors
- Felt tip pens, the colours of the rainbow.
- A pencil.
- A piece of wool.

Instructions:

1.- Draw a circle on the white card.

2.- Divide the circle into 7 or 14 segments.

3.-Colour in the segments: violet, dark blue, light blue, green, yellow, orange and red.

4.- Cut out the circle.

5.- Make 2 holes near the centre.

6.- Carefully, push the two ends of the wool through each hole.

7.- Spin the card.


When the circle spins very quickly...


We can't see all the colours, we can only see a whitesh colour.

Sandra García 6ºB

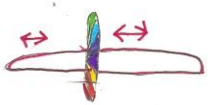
Process:(draw and write)

We draw a circle

We draw the lines in the circle

We colour the segments

We put the wool into the hole



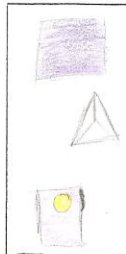
We pass the wool and it's happears withe

Conclusion: If we mix the 7 colours of the rainbow we can see the white

12

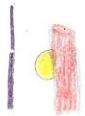
Raúl 6ºB

Process:(draw and write)

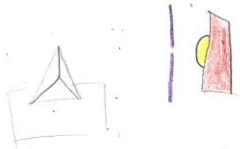


you need a prism, a torch a white paper and a cardboard

first cating a piece of card board



Seacond put the cardboard in front the torch



therd put the prism in front the cardboard and the paper under the prism

And see the rainbow

Conclusion: the white light is made up of all the colours of the rainbow

CONCLUSION: White light is made up of all the colours of the rainbow .

# How are colours made?

Experiment: MIXING COLOURS

You will need:
- Three light colour filters: green, blue and red.
- A proyector.

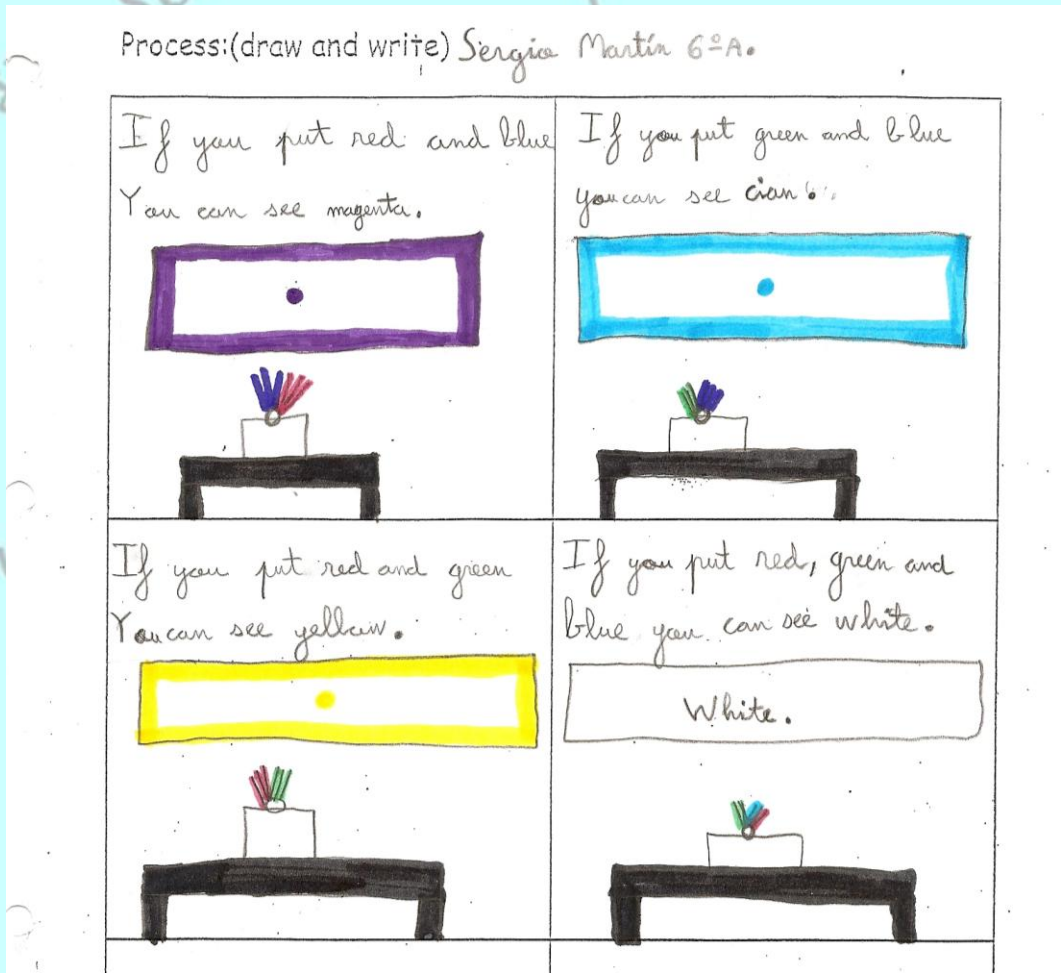
Instructions:

1.- Cover the light of the proyector with each filter.

2.- Cover the light of the proyector with two filters at the same time.

3.- Observe what colour can you see.

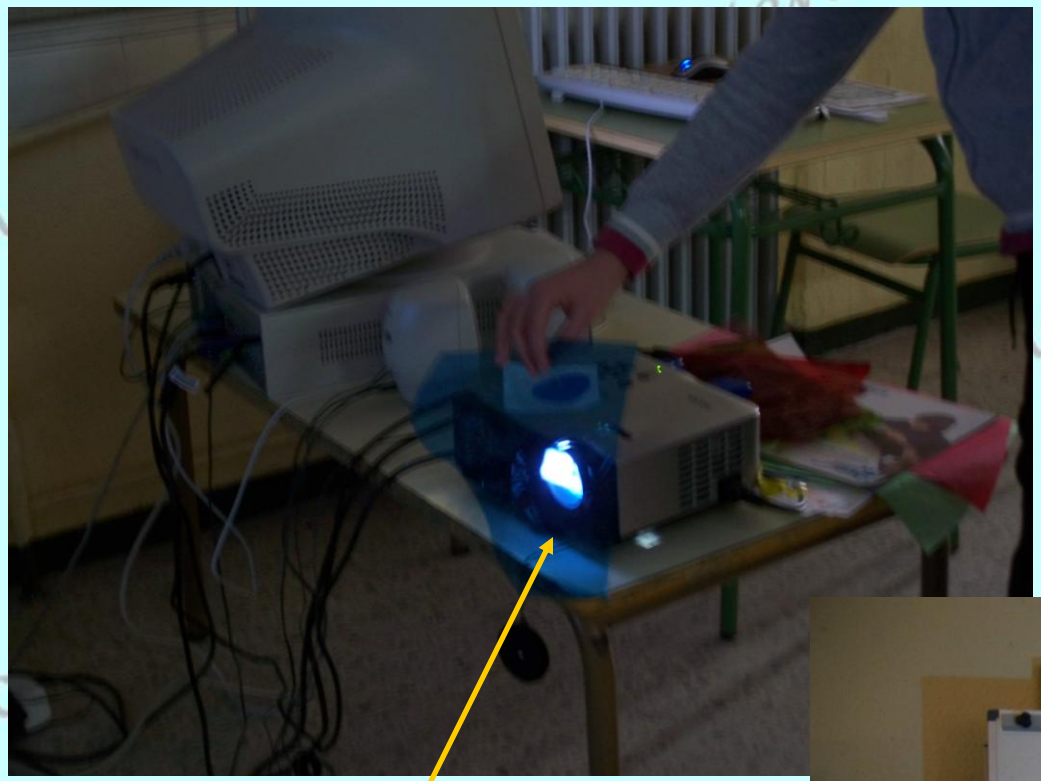
4.- Cover the light of the proyector with the three filters at the same time.



Red Light Filter

If we put a **red** light filter….

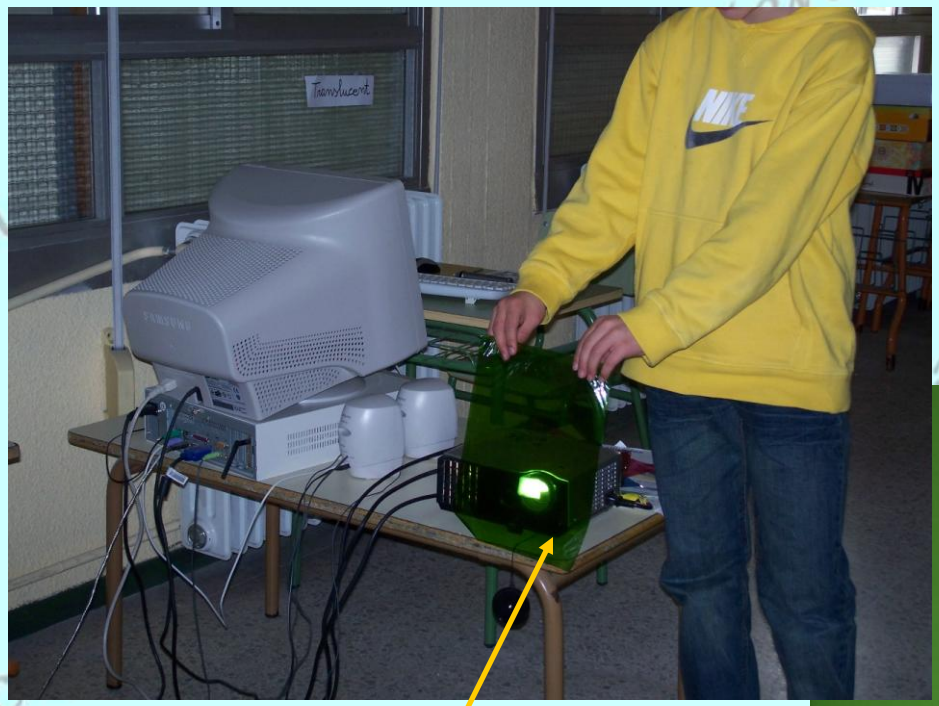
… we can see the whiteboard in **red** colour.



If we put a **blue** light filter….

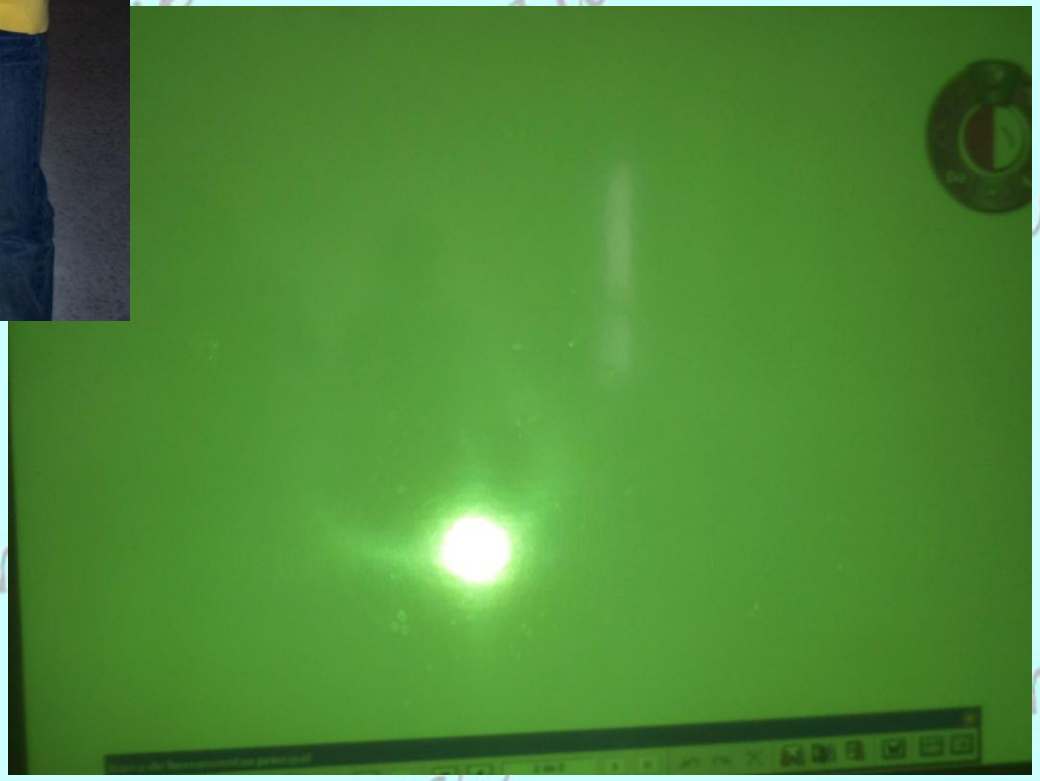
Blue Light Filter

… we can see the whiteboard in **blue** colour.

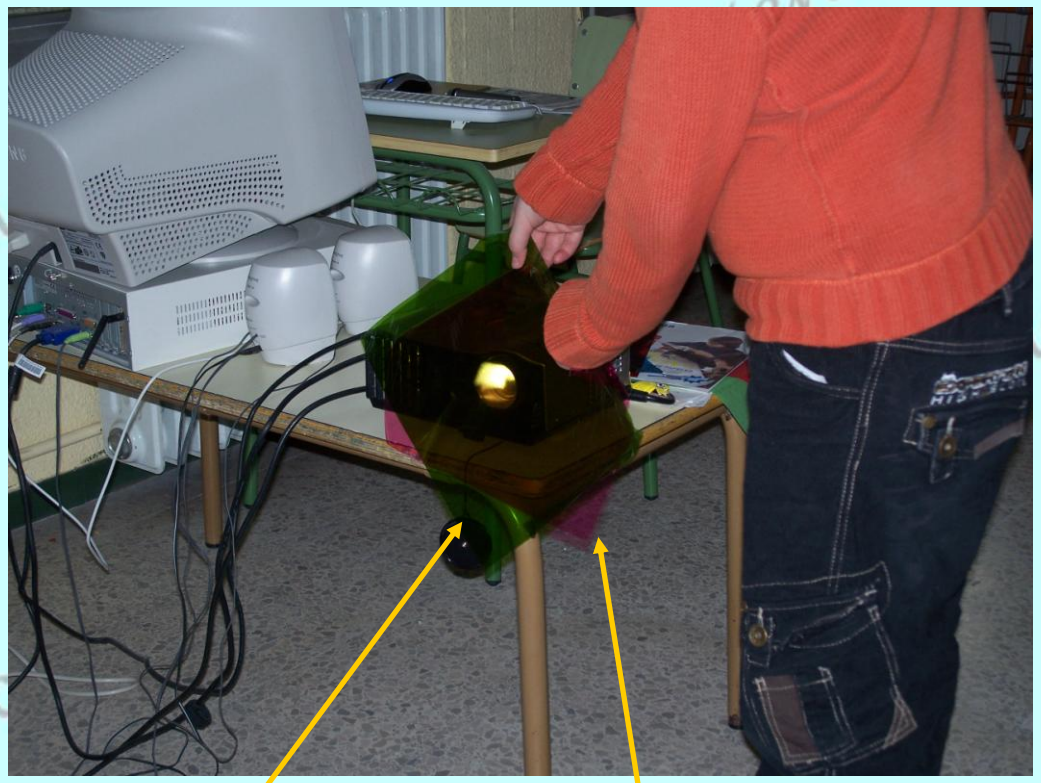



If we put a **green** light filter….

Green Light Filter



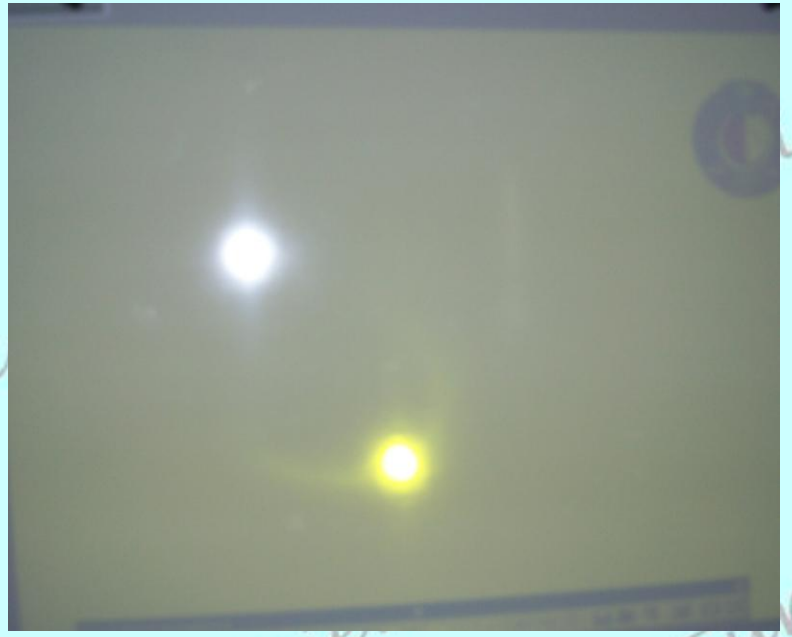
… we can see the whiteboard in **green** colour.



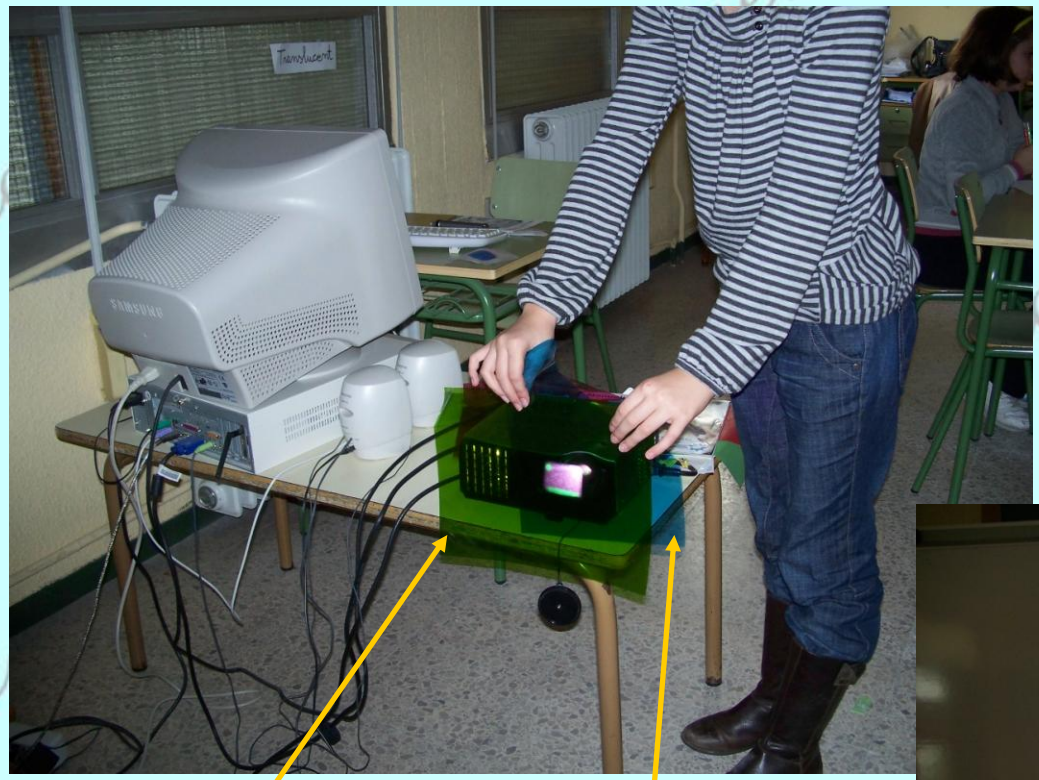
Green light filter

Red light filter

If we put **green** and **red** light filters…



… we can see the whiteboard in **yellow** colour.




If we put **green** and **blue** light filters…

Green light filter

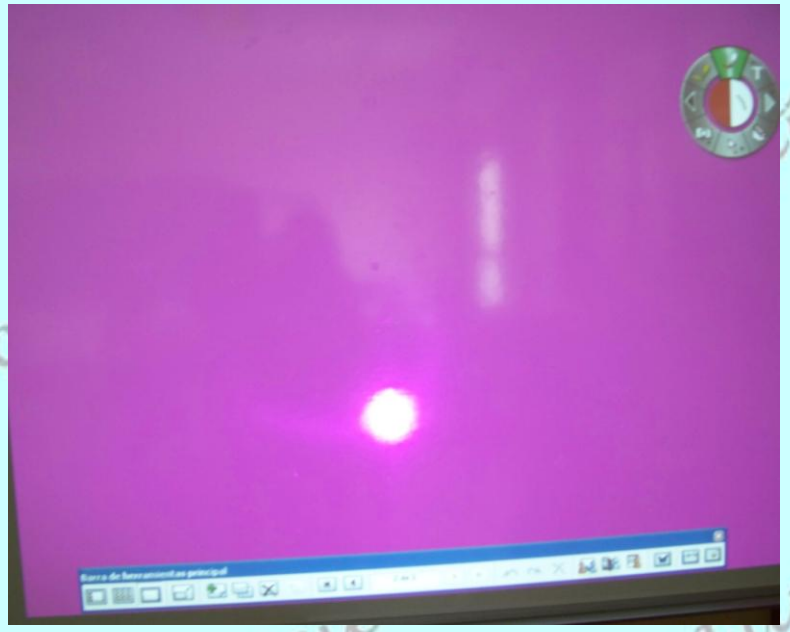
Blue light filter

… we can see the whiteboard in **cyan** colour.

Red light filter

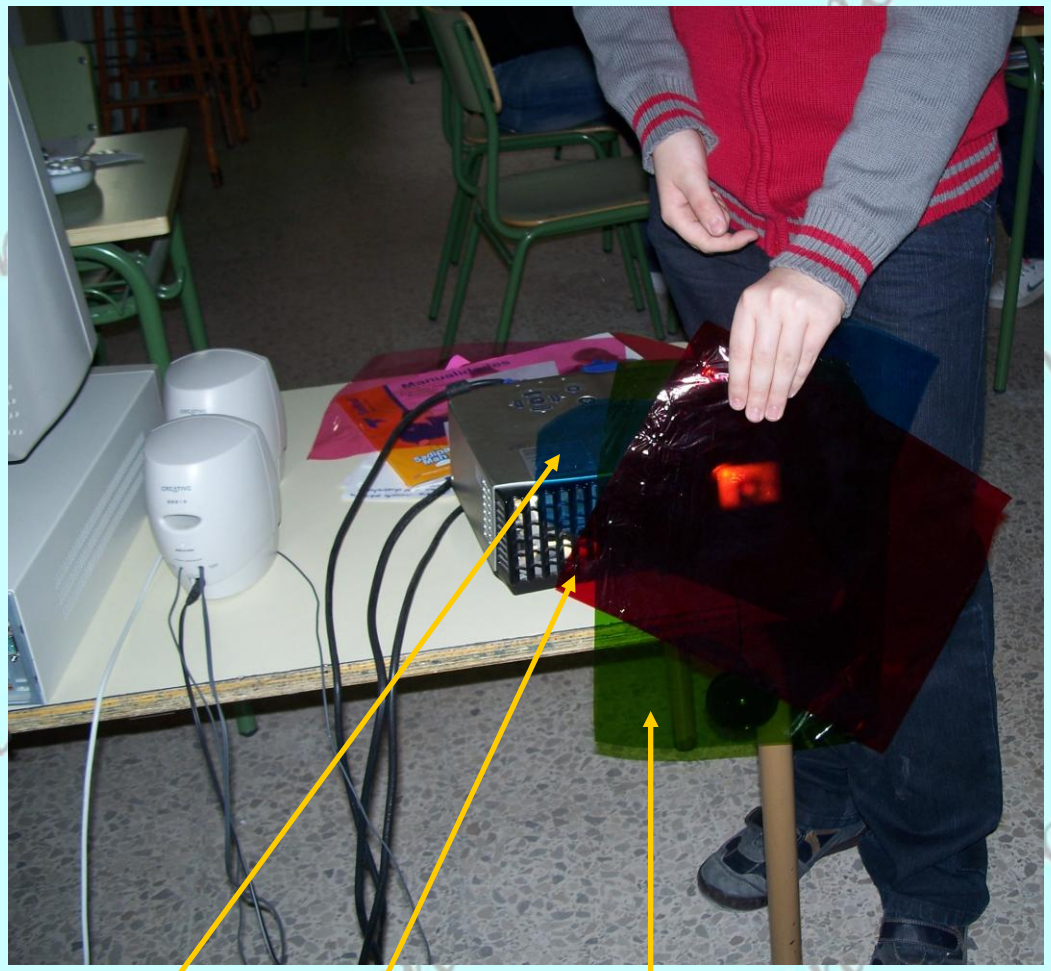
Blue light filter

If we put **red** and **blue** light filters…



… we can see the whiteboard in **magenta** colour.

If we put **blue**, **green** and **red** light filters….



Blue light filter

Red light filter

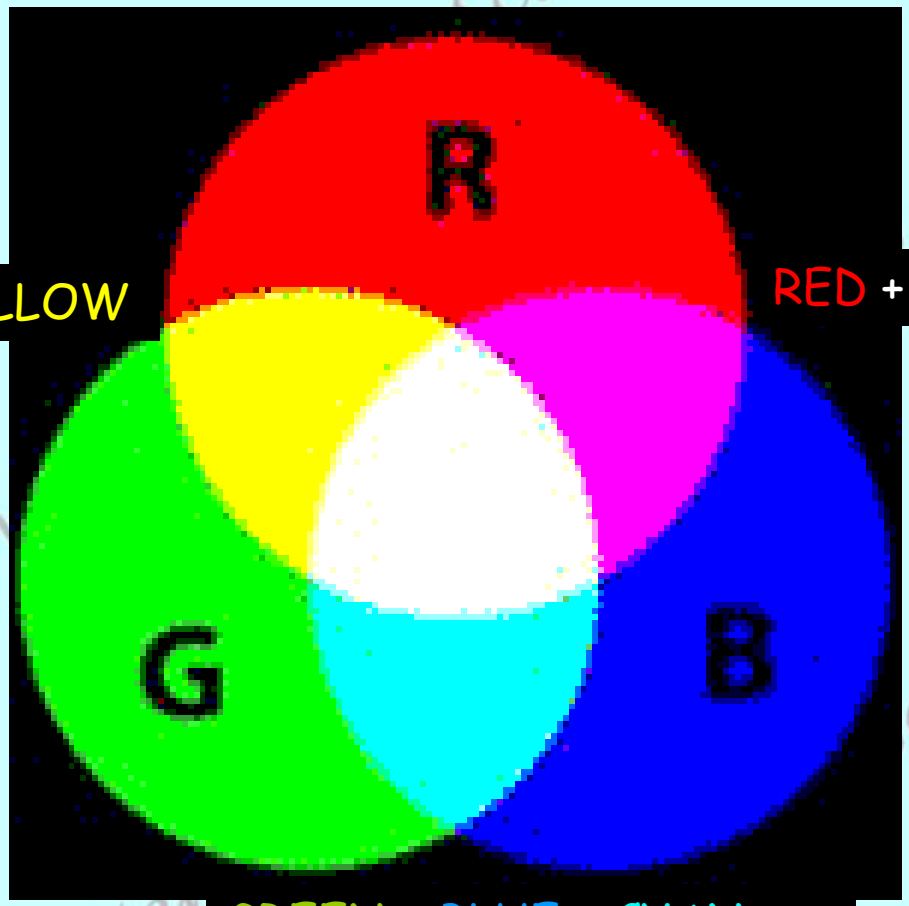
Green light filter

… we can see the whiteboard in **white** colour.

# Let's work with colours

RED, GREEN AND BLUE ARE THE PRIMARY COLOURS OF LIGHT

RED + GREEN + BLUE = WHITE




GREEN + RED = YELLOW

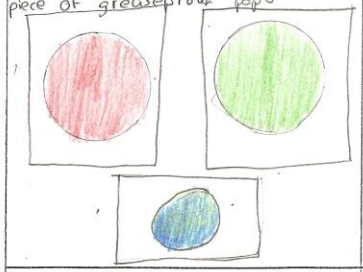
RED + BLUE = MAGENTA

GREEN + BLUE = CYAN

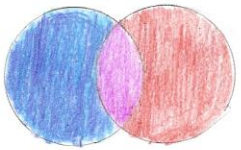
Cristina Soriano · 6º A

Process:(draw and write)

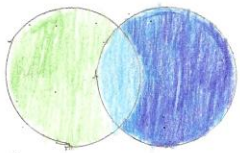
We draw 3 circles 1 red, 1 blue and 1 green on a piece of greaseproof paper



First we mix red on blue And we have magenta

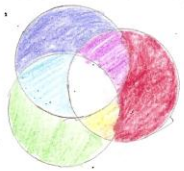


We mix green and blue And we have cian



We mix green and red And we have yellow.

We mix all the colours and we have white



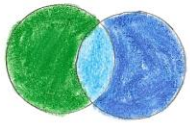
Conclusion:

the miting of the three light colours; blue, red and gree, makes all the colours.

Paula Parro

Process: (draw and write)

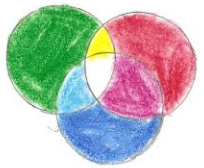
If we mix green and blue we make a type of light blue colour, it's called cian.

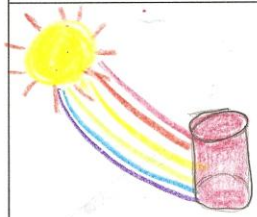


If we mix green with red we make yellow colour.

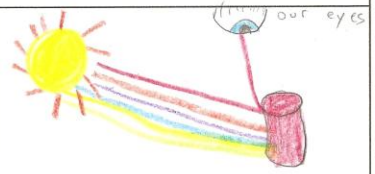
If we mix blue and red we make a type of purple called magenta

And if we make all the colour we make white.





We can see the bottle red because the light us all colours an the molecule of the bottle absorbs all the colours except...



the red, that it bounce and it go to our eyes and our eyes perceive the red colour and it send to the brain.

Conclusion:

The mixing of the three light colours : blue, red and green makes all the colours


We have seen the colours of a mobile screen by using a microscope

# How do our eyes work?

Experiment: PINHOLE PROJECTOR

You will need:
- A shoe box
- A piece of greaseproof paper
- A torch

Instructions:

1.- Push a drawing pin into the middle of one end of the shoe box.

2.- Cut out a rectangular window at the other end of the box and tape greaseproof paper over it.

3.- Cut another piece of greaseproof paper big enough to cover the lightbulb end of a torch.

4.- Draw a picture on the paper, colour and tape it on the torch.

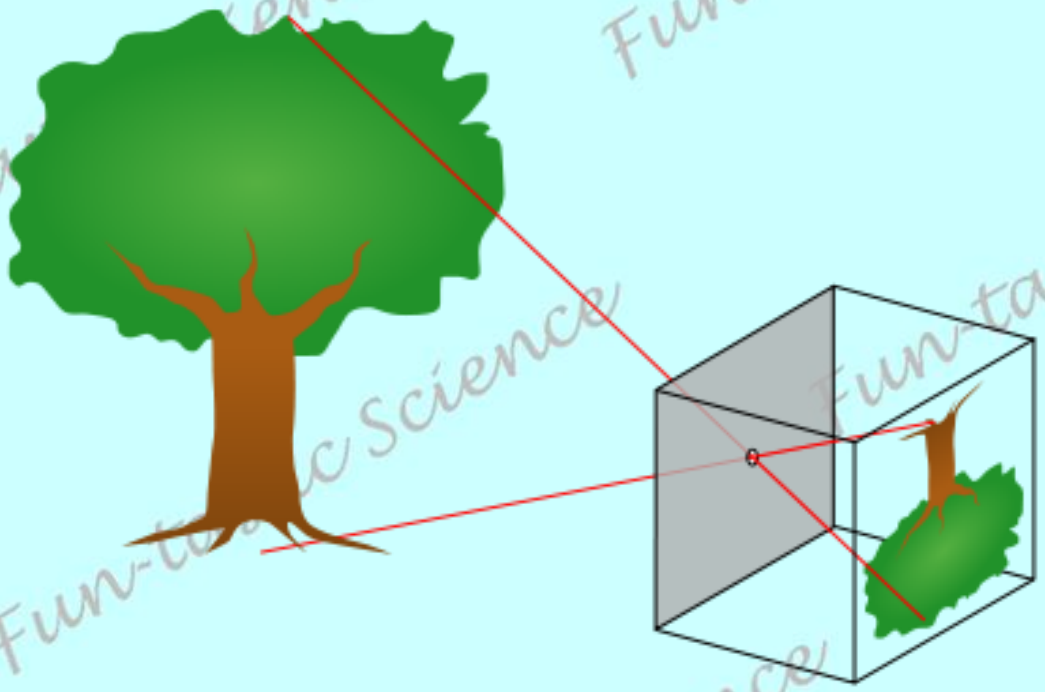
6.- Stand 1 m from the torch looking through the viewer and pointing the pinhole at the light.



On the viewer we can see the
picture of the tree upside down.

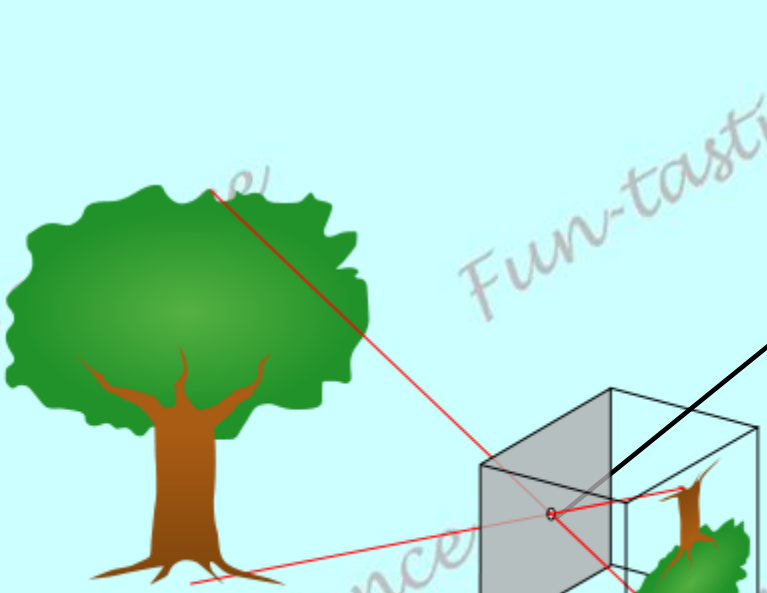
# What's going on?

Light from the torch passes through the pinhole onto your viewer, and rays from the bottom hit the top. These rays cross over when they pass through the pinhole, so you see the picture upside down.



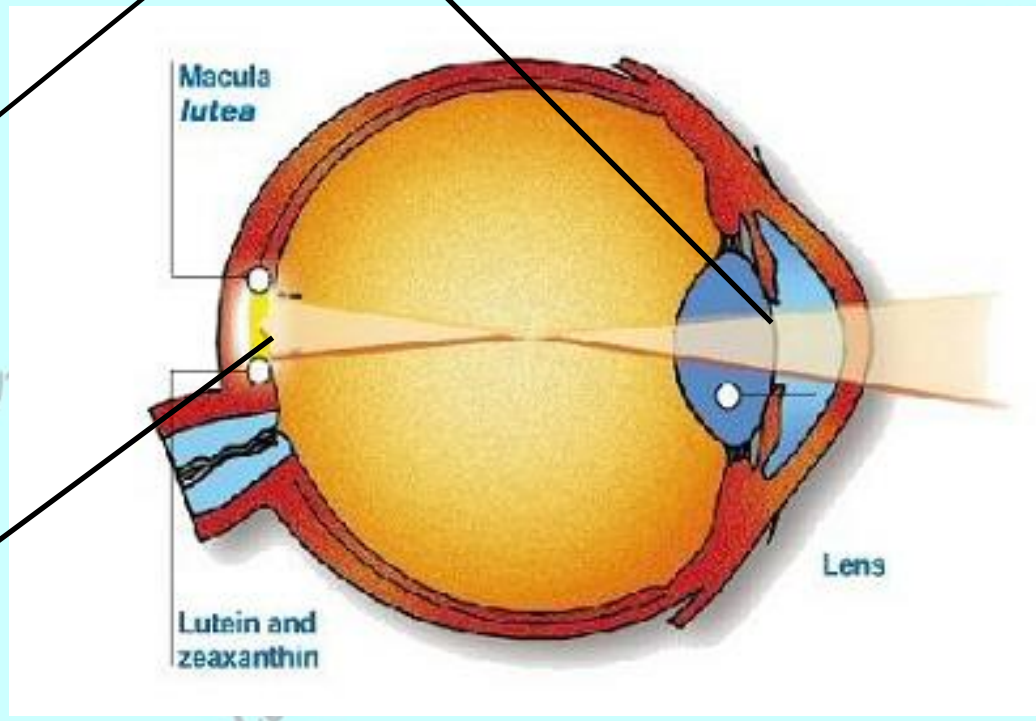
Our eyes work the same as the pinhole projector.

The pinhole is like our pupil and the the viewer like our retina.



Pupil

Retina



# How do we see colours?

The surface of an object reflects some colors and absorbs all the others.

We perceive only the reflected colors.

An object appears white when it reflects all the colours and black when it absorbs all of them.

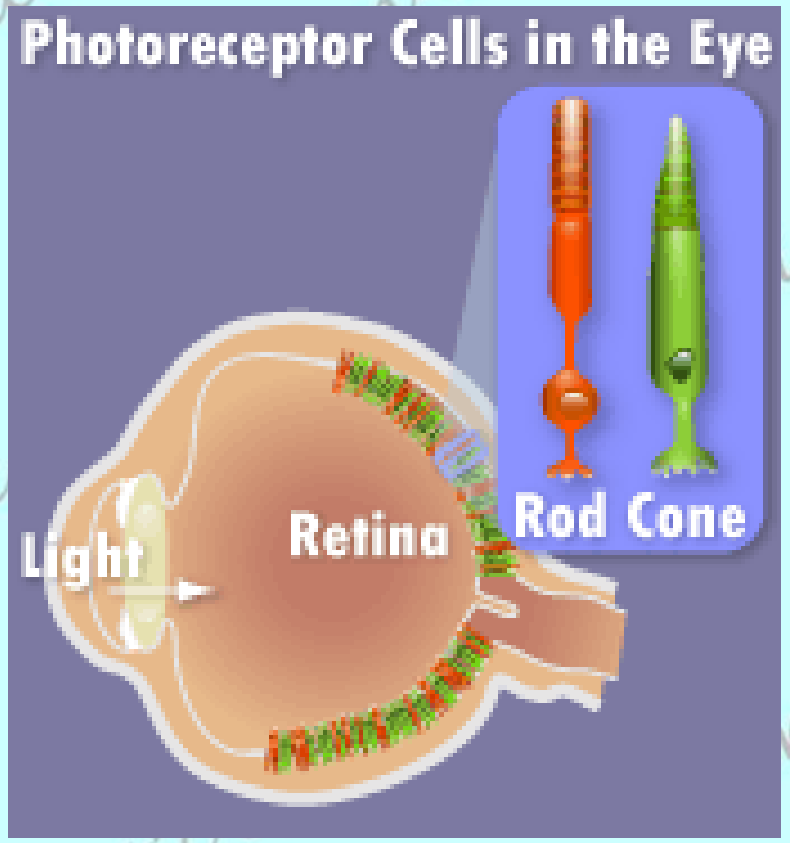
We can see the apple red because the skin of the apple reflects red colour and absorbs the rest of them.

First of all, light enters our eye through the pupil. The light focusses onto the back part of the eye, called the retina.

The retina is covered of two types of cells, called **rods** and **cones**.

The **rods** look like tiny cylinders that detects light.

**Cones** detect colour. There are three different types of cones. Each type will respond to a different colour, for example, one type of cone responds to the colour red. The other type of cone responds to the colour green. The third type of cone responds to the colour blue.

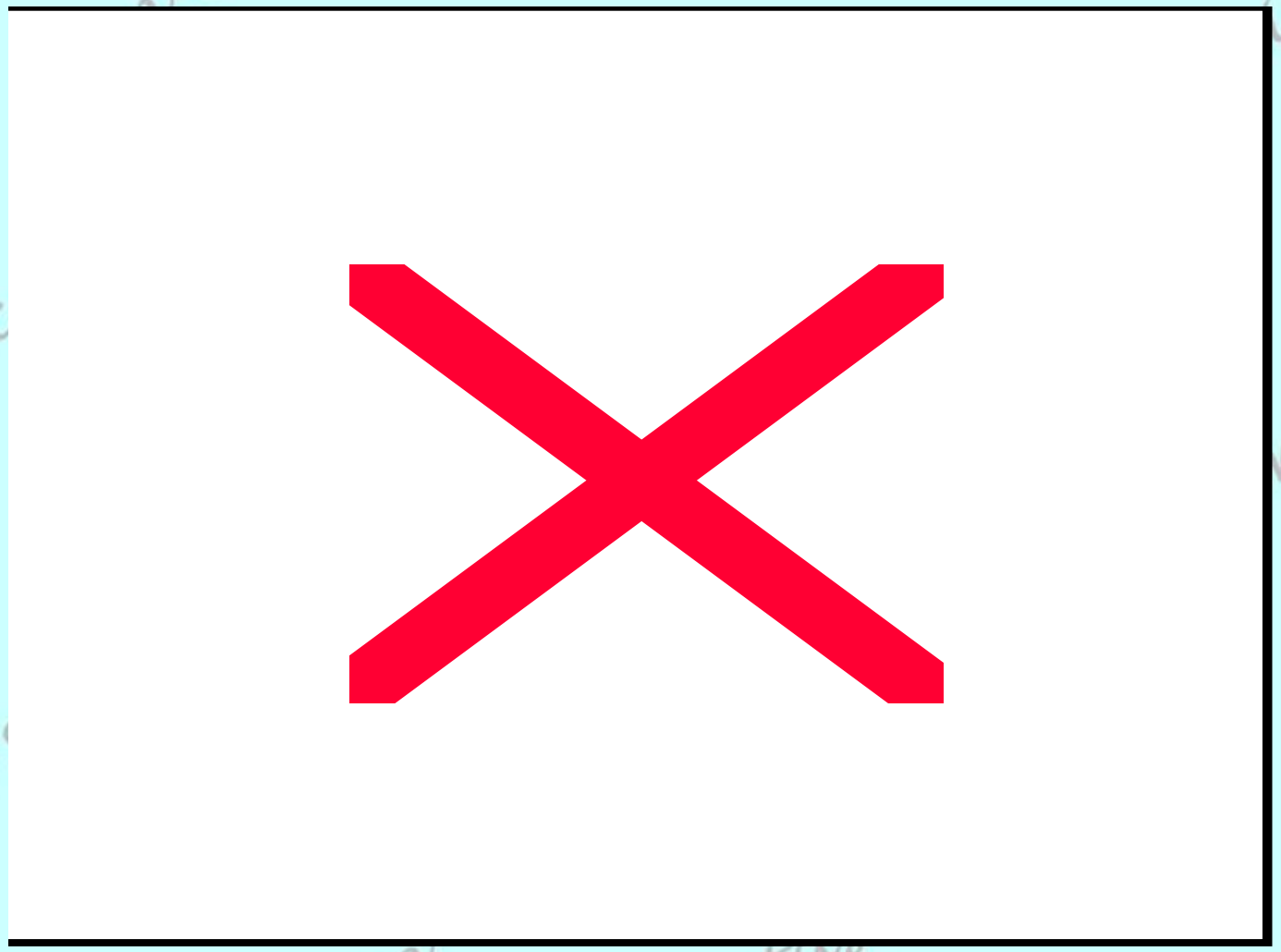


# Amazing Eyes


The Obama Illusion


We have been looking at these pictures during 1 minute and then we saw them everywhere.

# Let's sing the 'Rainbow Song'



# Learn more about light and colours

- http://www.odec.ca/projects/2003/kinga3a/public_html/introduction_to_light.html
- http://videos.howstuffworks.com/hsw/6243-out-of-darkness-vision-video.htm
- http://videos.howstuffworks.com/hsw/6243-out-of-darkness-vision-video.htm