



Light & Color Activities

Pre-K – Intermediate

Pre-K

Primary Pigments
Colors
Rainbows
Light and Shadows

Primary

Light and Shadows
Light and Color
Light and Reflection
Colors of Light

Intermediate

Pigment Colors
Light and Color
Color
Our Eyes and Light

Light and Color: PreK Activities

Pre-K Materials Inventory

Books:	In	Out
<i>Me Gusta Mi Sombra (I Love My Shadow)</i>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Return of the Shadows</i>	<input type="checkbox"/>	<input type="checkbox"/>
<i>A Rainbow of My Own</i>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Mouse Paint</i>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Rothko art book</i>	<input type="checkbox"/>	<input type="checkbox"/>
<i>A Color of His Own</i>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Planting a Rainbow</i>	<input type="checkbox"/>	<input type="checkbox"/>

Art Prints	In	Out
Vermeer #4- <i>A View of Delft</i> - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Mondrian- #17 #19-6 copies of each	<input type="checkbox"/>	<input type="checkbox"/>

Copy Masters	In	Out
Shadow Puppet sheet	<input type="checkbox"/>	<input type="checkbox"/>
2 Light Sources sheets	<input type="checkbox"/>	<input type="checkbox"/>
Rainbow Coloring sheet	<input type="checkbox"/>	<input type="checkbox"/>
Mouse Paint booklet sheet	<input type="checkbox"/>	<input type="checkbox"/>
2 chameleon masters (large & small)	<input type="checkbox"/>	<input type="checkbox"/>
1 picture of a rainbow	<input type="checkbox"/>	<input type="checkbox"/>

Manipulatives:	In	Out
10 CDs	<input type="checkbox"/>	<input type="checkbox"/>
6 tissue paper cutout sheets	<input type="checkbox"/>	<input type="checkbox"/>
3 color "gel" tubes	<input type="checkbox"/>	<input type="checkbox"/>
1 set of color templates(7 sheets)	<input type="checkbox"/>	<input type="checkbox"/>
1 flashlight	<input type="checkbox"/>	<input type="checkbox"/>
6 sets of color paddles (red, blue, green, yellow....a total of 24)	<input type="checkbox"/>	<input type="checkbox"/>
12 brushes	<input type="checkbox"/>	<input type="checkbox"/>
1 spray bottle	<input type="checkbox"/>	<input type="checkbox"/>

Light and Color: PreK Activities

Lesson #1: Primary Pigment Colors

Materials in the Kit

- Mark Rothko book
- A Color of His Own book
- 6 Sets of color paddles
- 6 Tissue paper cutout sheets
- 3 Color “gel” tubes
- 2 Chameleon masters
- 12 Brushes
- 1 set of Color templates

Materials Provided by Site

- Paints-red, yellow & blue (tempera, watercolor or fingerpaints)
- Dishpan for water
- Foam meat trays
- Paper for chameleon prints
- Paper for mural
- Glue or water
- Overhead
- Tissue paper

Main Ideas:

1. All the colors we see around us come from only 3 colors: red, yellow and blue.
2. The 3 primary colors can be combined to produce orange, purple and green.
3. Some artists, like Mark Rothko, created huge paintings by just using large areas of color.

Activity:

Intro:

1st: Look all around you at the beautiful colors in our world! You can see bluebirds, red stop signs, green valleys, orange sunsets, and so much more! Color not only makes the world a beautiful place to live in- it also is an important part of our world.

Color is used to control traffic with red, green and yellow traffic lights. Can you think of anything else we use color for?

There are 3 primary colors of pigments. (Display the template of primary colors.) Can you find any things in the library that have these colors?

Have you ever mixed paint colors to make other colors? When we mix the primary colors red, blue & yellow, we can create the secondary colors: orange, green & purple. (Demonstrate making the secondary colors by using the ready-made tissue paper sheets and holding them in front of the light from an overhead.....e.g. red and yellow together make orange.) Continue with the other color combinations.

Light and Color: PreK Activities

Hold up color paddles in the primary colors. Pass them out to the children to make combinations that will produce orange, green and purple.

Display the template of secondary colors.

2nd: Use the Rothko art book....pgs 48-60, 70-71. (Rothko painted using a vertical format on huge canvasses, sometimes more than 300cm tall. He wanted to create the feeling that the viewer was inside the painting. He preferred bright reds and yellows.)

This artist created huge paintings using basic colors. (Display the paintings in the book.) Do you think you could paint like this? Discuss the paintings.

3rd: All animals have colors of their own, except the chameleon. Elephants are gray and pigs are pink. What are the colors of these animals? Zebra? Giraffe?? Deer?? Mouse?? Polar bear??

Now we are going to read a story about a chameleon that goes looking for his own color. It's called *A Color of His Own* by Leon Lionni.

4th: Use the colored "gel" tubes to display the mixing of colors. As they are gently "waved" from side to side the colors will mix, e.g. the blue & yellow "gels" in the tube will form green, etc.

Choice of Activities:

Color the Chameleon.

This activity can be done with paints or tissue paper. Have copies of the chameleon printed on light paper, preferably white. If you are using paints (either tempera or water colors), have the students put dabs of 2 different primary colors on their chameleon...not touching. Then use a paintbrush to mix the colors.

If you are using tissue paper, have the red, yellow and blue tissue papers torn into small pieces. You can use either water or glue to attach the tissue paper pieces to the chameleon. The children can either brush the glue on the chameleon and then pat pieces of 2 different primary colors at either end of the chameleon and then mix them in the middle to make a secondary color. Or the children can wet their fingers in water and dab the 2 primary colors at either end and then mix the colors in the middle.

Hand print Activity

This can be done as a large mural or individual pieces. Have the 3 primary colors of paint (either tempera or fingerpaints) ready in individual foam meat trays. Have water nearby in dishpans. The children choose 2 colors. They place the palm of their left hand in one color and their right hand in the other color. They make a handprint on the left side of the paper and a handprint on the right. Then they rub their hands around together in the middle and make a secondary color. If possible, they can wash their hands and repeat with 2 other colors.

Light and Color: PreK Activities

Lesson #2: Colors

Materials in the Kit

- 2 Mondrian art prints #17 & #19- 6 copies of each
- Mouse Paint Book
- Mouse Paint booklet master
- 6 sets of color paddles
- 1 Spray bottle

Materials Provided by Site

Based on the chosen activities....

- Coffee filters & red, yellow & blue markers
- Coloring utensils for Mouse Paint booklet
- Shaving cream, Ziplocs & food coloring
- Paper plates or white paper and tempera paint & plastic wrap

Main Ideas:

1. All colors we see come from just 3 colors.
2. The 3 primary colors can be combined to make secondary colors.
3. Colors can be grouped into families.
4. Piet Mondrian was an artist who created paintings with the 3 primary colors.

Intro:

1st: Ask the children if they have ever mixed their paints when they were painting. What happened?

Read the book *Mouse Paint* showing every picture and asking the children what they think is going to happen when the mice mix their paint.

Review the color names- red, blue and yellow. Explain that they are called primary colors and that they make all of the other colors.

Use the color paddles to illustrate the 3 primary colors and the 3 secondary colors. Also display the color templates for the primary & secondary colors.

2nd: Share 2 of Piet Mondrian's art prints. (Read info sheet on the artist) Mondrian created many paintings just using straight lines and the 3 primary colors

Choice of Activities:

Mouse Paint booklet.

Have copies ready of the Mouse Paint title page and the color pages for each child. The children can duplicate mixing the primary colors to create secondary colors. You may choose to use markers, crayons, colored pencils or paints.

Light and Color: PreK Activities

Coffee Filter Color Mix.

Have the children draw with red, yellow and blue markers on a coffee filter. Then spray them with water and the colors will automatically create a secondary design.

Shaving Cream Color Mix.

Explain that each child is going to get a Ziploc bag with some shaving cream inside. Caution them not to open their bags. Go around and drop 2 different colors of food coloring into each bag and seal again. Make sure the children know which 2 colors you have dropped in, since the yellow food coloring tends to look like orange. Once every child has their food coloring drops, they can squish their bag very gently to mix and create their colors.

After everyone has mixed their colors together, ask several children what colors they started with and what they ended up with. A chart can be made if you'd like.

Handi-Color Mix.

Give each child a paper plate or white paper. Put the primary colors of tempera paint on the plate or paper in little puddles, about the size of a ½ dollar. Next put plastic wrap on top of the paint. The children will then mix the colors together with their fingers on top of the plastic wrap.....like finger painting w/o the mess. (The children will be amazed when they create greens, and purples and oranges that weren't there when they started.)

When they are finished, pull off the plastic wrap and leave the painting to dry. They make wonderful abstract paintings.

Lesson #3: Rainbows

Materials in the Kit

A Rainbow of My Own book
Planting a Rainbow book
CDs
Rainbow worksheet
Picture of a rainbow

Materials Provided by Site

White paper
Coloring utensils
Construction paper, glue & tape

Main Ideas

1. A ray of light from the sun is made up of 7 different colors.
2. The colors of a rainbow are always in the same order.

Intro:

1st: We often think of rainbows as being magical. There are always charming legends about little leprechauns and pots of gold at the end of the rainbow. How many of you have ever seen a rainbow? What did it look like? When did you see it? How many colors did you see? Can you name any of the colors?

How do you think a rainbow forms? For a rainbow to appear.... your eyes, the rain and the Sun have to be lined up just right. When rain is falling from high in the sky, the droplets are round. The light from the sun goes in one side of the raindrop, bounces off the backside of the raindrop and comes back out the front. By then it is broken up into colors.

Have the sample rainbow ready to display. Stress how the colors are always in the same order. (red-orange-yellow-green-blue-indigo and purple) Have students identify the colors of the rainbow in objects around the room.

2nd: Pass out old CDs. Have the children observe the rainbows on the shiny side. (If the children ask how come they're seeing a rainbow when there isn't any rain present....tell them that the CD has tiny little grooves that bounce the light around and break it up into colors., the same way the light gets broken up as it bounces around inside of raindrops.

3rd: Ask the children if they have ever had an imaginary friend? What kinds of things did they do together? Explain that in the story you're going to read, a young boy imagines that a beautiful rainbow is his playmate.

Read *A Rainbow of His Own*.

Light and Color: PreK Activities

Choice of Activities:

Color A Rainbow.

Either have the children color the rainbow worksheet or tape 6 crayons (they don't have to remember the color indigo at this age) of the colors of the rainbow in order, in a row and teach them to draw a rainbow with one stroke.

Plant a Rainbow.

Read *Planting a Rainbow* and have the children "plant" a garden in rainbow colors with any coloring utensils or cutting shapes out of construction paper.

Light and Color: PreK Activities

Lesson #4 - Light and Shadows

Materials in the Kit

Book- *Me Gusta Mi Sombra*
Book- *Return of the Shadows*
Shadow puppet master
2 Light sources master
Vermeer art print #4, *A View of Delft* - 6 copies
Flashlight

Materials Provided by Site

Overhead
Sticks
Glue and scissors
Construction paper
Varied objects that might or might not produce shadows (solid, clear, frosty)

Main Ideas:

1. All light comes from a source.
2. Sources can be natural, like the sun, or artificial, like a lamp.
3. The sun is the brightest source of light.
4. Some things make better shadows than others
5. Artists use shadows in their paintings.

Intro:

Light is all around you. Light makes it possible for us to see. Without light, the world would be a dark, cold place. How many things can you think of that make light?

Discuss with children that the sun is the primary source of light. Ask: What do we use light for?

Activity:

Emits or Reflects?

Pass out the light sources worksheets and have the children look at and discuss which ones produce light and which ones reflect light. Cut the pictures apart and glue them in the correct column. (This can be done as a group activity also by using a transparency on the overhead with the pictures already cut apart. Students can come up and place them in the correct column.)

Light and Color: PreK Activities

Intro:

2nd: Discuss that light cannot travel through all things. When it cannot travel through something, a shadow is produced. Discuss how light can pass through a window but not a solid wall. Demonstrate by holding up various objects in front of the beam of a flashlight. E.g. a book, a pen, a clear piece of plastic, etc. Ask the children if they've ever seen their shadow. When does their shadow appear?

3rd: Read *Me Gusta Mi Sombra (I Love My Shadow)*, a story about a little boy who loves his shadow. (Even though it is in Spanish, the reader can figure out what to say to the children by looking at the illustrations and/or using basic Spanish skills.)

Then read *Return of the Shadows*, a story about how shadows got mixed up one day.

4th: Display Vermeer's art print, *A View of Delft*, and discuss the shadows in the painting and how they were formed.

Activity

Shadow Puppets

Let the children cut out copies of the shadow puppet and attach them to sticks or have them draw and cut out their own figure to make a shadow puppet. They can then play with their puppets in the light from the overhead. Or let the children experiment making hand shadows with the light from the overhead.

Primary Kit Inventory

Books	In	Out
Caravaggio	<input type="checkbox"/>	<input type="checkbox"/>
Return of the Shadows	<input type="checkbox"/>	<input type="checkbox"/>
The Facts About Light	<input type="checkbox"/>	<input type="checkbox"/>
Light and Color	<input type="checkbox"/>	<input type="checkbox"/>

Art Prints:	In	Out
Vermeer #3-Young Woman with a Water Pitcher 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Vermeer #4- View of Delft- 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Mondrian- #18, - 6 copies of each	<input type="checkbox"/>	<input type="checkbox"/>
Mondrian - #20 - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Mondrian #21 - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet - #11- 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet - #13 (Haystacks) - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet - #14 (Mirror Image) - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet - #16 (Haystacks) - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet – Two Haystacks- 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet – Water Lilies- 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet – Japanese Bridge- 6 copies	<input type="checkbox"/>	<input type="checkbox"/>

Copy Masters:	In	Out
Prediction Chart worksheet	<input type="checkbox"/>	<input type="checkbox"/>
Haystack coloring sheet	<input type="checkbox"/>	<input type="checkbox"/>
Mirrors Reflect activity sheet	<input type="checkbox"/>	<input type="checkbox"/>
Krazy Kaleidoscope coloring sheet	<input type="checkbox"/>	<input type="checkbox"/>
Color Poem worksheet	<input type="checkbox"/>	<input type="checkbox"/>
Hand Shadow Puppet master	<input type="checkbox"/>	<input type="checkbox"/>

Manipulatives:	In	Out
6 flashlights	<input type="checkbox"/>	<input type="checkbox"/>
30 mirrors	<input type="checkbox"/>	<input type="checkbox"/>
6 magnifying glasses	<input type="checkbox"/>	<input type="checkbox"/>
6 color paddles	<input type="checkbox"/>	<input type="checkbox"/>
30 teddy bear counters	<input type="checkbox"/>	<input type="checkbox"/>
10 plastic kaleidoscopes	<input type="checkbox"/>	<input type="checkbox"/>
12 diffraction glasses	<input type="checkbox"/>	<input type="checkbox"/>
1 prism	<input type="checkbox"/>	<input type="checkbox"/>
1 plastic shoebox	<input type="checkbox"/>	<input type="checkbox"/>
1 set of color templates	<input type="checkbox"/>	<input type="checkbox"/>

Light and Color: Primary Activities

Lesson #1: Light and Shadows

Materials in the Kit

Caravaggio book

Vermeer art print #3 *Woman with a Water Pitcher*

Monet art print #13 *The Haystacks*

Return of the Shadows book

Haystack coloring sheet master

6 flashlights

6 magnifying glasses

6 sets of color paddles (24 total, 4 ea. red, blue yellow and green)

Hand shadows master

Prediction Chart master

Materials Provided By Site

Black construction paper

Drawing paper

Coloring utensils

Overhead

Opaque, transparent & translucent materials; e.g. tissues papers, wax paper, foil, clear plastic, construction paper

Main Ideas

1. Light has three important properties.
 - a. Light travels in a straight line.
 - b. Light travels fast.
 - c. Light cannot travel through most things and therefore shadows are created.
2. Materials can be classified as transparent, translucent and opaque.
3. Light is an important part of an artist's paintings.
4. Artists use shadow to make things more dramatic.

Intro

When a ray of light hits an object, the light may pass through the object, be reflected or soaked up (absorbed). What happens to the light depends on the type of material it strikes. Some materials such as clear glass and clear plastic let the ray of light pass straight through them. The materials are called transparent. (Actually some the light is reflected that doesn't have to be stressed with the age level.)

A few materials such as waxed paper and tissue papers let some of the light pass through. They are called translucent.

Materials such as brick and wood do not let any light pass through them. The materials are called opaque.

Light and Color: Primary Activities

Activity

Transparent, Translucent or Opaque

Prepare ahead of time a tray with a flashlight, magnifying glass, construction paper, mirror, colored paddles and a copy of the prediction chart. Working in small groups, have the children guess whether or not each object is Transparent, Translucent, or Opaque. Show them how to record their predictions on the chart.

Have them test the transparency of each object by shining a light on it. Does the light go through the object? Does the object make a shadow?

If the object does not make a shadow, it is transparent.

If the object makes a light shadow, it is translucent.

If the object blocks the light, it is opaque. *Note: The only way an object will make a shadow is if the light is far enough away from the object so that some of the light can go around the object.*

Light and Color: Primary Activities

Lesson #2- Light and Color

Materials in the Kit:

- Set of color templates
- 6 sets of color paddles (red, blue, yellow & green...a total of 24)
- 3 Mondrian art prints #18, 20 & 21- 6 copies of each
- 2 Monet art prints: *The Japanese Bridge & Waterlilies*.- 6 copies of each
- Color poem master
- My Many Colored Days* book

Materials Provided by Site:

- Old magazines
- Large construction paper
- Scissors and glue

Main Ideas:

1. The primary colors of pigments are red, yellow and blue.
2. The secondary colors are orange, purple, and green.
3. Colors can be divided into warm and cool colors.
4. All the colors we see come from just 3 colors.
5. Colors can express moods or feelings.
6. Piet Mondrian painted with primary colors.
7. Claude Monet painted with cool colors.

Intro:

1st: Begin a discussion about color. Who can name the primary colors? Why are they called primary? Display the primary color template.

What happens when you mix the primary colors together? What are these new colors called? Display the secondary colors template. Why are they called secondary colors?

Let the children experiment mixing the colors together with the color paddles.

2nd: Display Mondrian's art prints #18, 20 & 21. Ask the children: What primary colors do you see in these paintings? What secondary colors were used? Read the info sheet about Mondrian and how he changed the colors of his house/studio.

3rd: Display Monet's art prints of the Japanese Bridge & the 3 Waterlilies. What are the main colors that Monet liked to use? How do those colors make you feel? (relaxed, happy, peaceful) Those colors are called cool colors. What colors do you think would be considered warm colors? (red, orange, yellow) Show the color templates for analogous, warm and cool colors.

Light and Color: Primary Activities

4th: Read *My Many Colored Days*. Make a list of the feelings associated with different colors. E.g. feeling blue, green with envy, turning beet red, etc.

Activity

Shades of Blue

Discuss with the children the fact that two things can be blue (or red, green, yellow, etc), but still not be exactly the same color. Explain to children that there are different shades of the same color. Ask the children to look around the room and point out things that are different shades of the same color.

Next explain to the children that they are going to make a collage to show the different shades of a color. Distribute magazines and scissors. Tell the children to choose a color for their collage and have them look through the magazines for pictures with that color. They can work alone or with a partner.

Have them use the pictures to make a collage of that color on a large piece of construction paper. (You may want to have the construction paper match the color of their collage items.) Then help the children label their collages.

Discuss the collages and help the children develop descriptive vocabulary by encouraging them to use words and phrases such as dark red, bright yellow, dull green, pale blue, etc.

Color Poem

Pass out copies of the Color Poem worksheet and have the children write their own color poems.

Light and Color: Primary Activities

Lesson #3 - Light and Reflection

Materials in the Kit:

30 mirrors
30 teddy bears
Mirrors Reflect worksheet master
10 Plastic kaleidoscopes
Vermeer art print #4- *A View of Delft*- 6 copies
2 Monet art prints # 11- *The Ducal Palace* & #14- *Waterlilies*- 6 copies of each
Kaleidoscope coloring sheet master
The Facts About Light book

Materials Provided by Site:

Coloring utensils
Tape

Main Ideas:

1. When light hits an object, it bounces off in all directions. This is called reflection.
2. We see most things by the light that is bouncing off of them.
3. Artists use mirror images to show reflections in their paintings.

Intro:

1st: You probably already know the word reflection for when you look in a mirror and see yourself. Almost all of the light that hits the mirror is reflected back in your direction, so you can see yourself clearly.

Now look at a wall. Can you see anything but the wall? You see light being reflected off the wall, but not all of the light this time. The only light that is reflected off the wall back to your eyes is the part of the light that is the color of the wall, e.g., If you're looking at a blue wall, the wall is reflecting just the blue light back to you and absorbing the rest.

Read pgs 16 & 17 in *The Facts About Light* book.

2nd: Show Monet's art prints: # 11- *The Ducal Palace* and #14- *Waterlilies*. Discuss how Monet used mirror images. Ask the children if it is a calm day or a windy day. Would the image have been different if it was rough and windy?

Show Vermeer's print #4- *A View of Delft*. Discuss the reflections of the building. Note how smooth the water is....just like glass.

Light and Color: Primary Activities

Activity:

Mirror, Mirror

Give each child a mirror. Have them hold it up level with their eyes. Ask them what they see. (themselves) Instruct them to move the mirror to the side until they can see the person behind them. Can the person behind see your face? (yes) Can you see your own face now? (no) Give the children time to experiment with things around them to discover some properties of light. Make a chart to record some of their observations. Caution----remind the children never to flash light in someone's eyes.

Mirrors Reflect

Hand out the student sheet titled "Mirrors Reflect" and a teddy bear counter (or any other 3 dimensional object). Use crayons or markers to color each line as labeled. Place the teddy bear on the small footprints. Have the children place the mirror on the red line behind the bear. They should see the back of the bear. Hand out another mirror or team the children up to work as partners. Next, place a mirror on each of the green lines; make sure they touch in the center. They should see 3 or more images of the bear. (The mirrors are reflecting light back and forth, making more images.) Place 2 mirrors on the blue lines, touching at the center, and they should see no bears. Light travels only in straight lines, and the mirrors cannot pick up the bear's image in this position.

Kaleidoscope

Pass out the plastic kaleidoscopes and allow the children a little bit of time to see the patterns in the kaleidoscope. Then have the children color the geometric designs on the Kaleidoscope page. When they are finished coloring, have them hold two mirrors together like a book to form a right angle. They will then place the mirrors on their kaleidoscope drawing and tip the mirrors back and forth. They can also move them across the design for changing effects. Open the mirrors wider or push them closer together. (The two mirrors can be taped together temporarily.)

Light and Color: Primary Activities

Lesson #4- Colors of Light

Materials in the Kit:

12 Diffraction glasses
Plastic tub
Flashlight
Mirror
Flashlight & prism
Light and Color book
3" circle form for color wheels
Dichroic Light Sculpture

Materials Needed by Consumers:

Overhead
Coffee filter strips or white paper towel strips
Tagboard or posterboard for circles
Plastic cups
Black felt tip pens
Coloring utensils
Toothpicks, string or pencils

Main Ideas:

1. A ray of light from the sun is made up of seven different colors that are visible to the naked eye. These seven colors together are known as a spectrum.
2. Each color has a different wavelength or speed.
3. Artists like Ray Howlett interfere with the wavelengths of color to create art.
4. These 7 colors of light give color to everything around us.

Intro

1st: Ask the children if they have ever seen a rainbow. Did they find a little leprechaun with a pot of gold at the end of it? What must happen in order for a rainbow to appear in the sky? For a rainbow to appear, you must have your eyes, the rain and the Sun lined up just right. When rain is falling from high in the sky, the droplets are round. The light from the sun goes in one side of the raindrop, bounces off the backside of the raindrop and comes back out the front. By then it is broken up into colors.

Light and Color: Primary Activities

Demo:

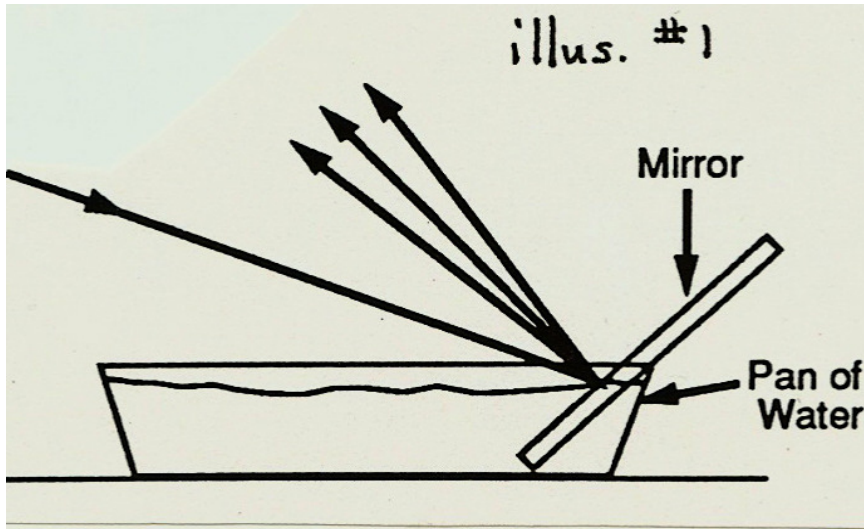
1. Place a tub of water on a flat surface where the children can look on.
2. Submerge a mirror about halfway into the water, making sure it is at an angle. Tape the mirror in place at the end of the tub. (see illustration.#1 at end)
3. Shine the flashlight on the part of the mirror that is underwater.
4. Either hold a white piece of paper behind the flashlight to catch the reflecting light or look for the reflected light on the walls or ceiling. (You may need to move or tilt the angle of the flashlight to catch the reflection.)
5. Discuss:
What happened? Where did the rainbow come from? (The white light from the flashlight is really composed of the 7 colors of the rainbow or spectrum.)

When the light shines through the water and reflects off the mirror, the light splits into a spectrum of colors that appear just like a rainbow. This is the same way a rainbow is created in the sky. The sun shines through the rain, splitting the sun's white light into 7 visible colors.

The colors of the spectrum or rainbow are red, orange, yellow, green, blue, indigo and violet. The colors are always in the same order. (That's because they each have a different wavelength. Red has the longest wavelength and violet has the shortest.)

6. This activity can also be done with a prism and an overhead projector or flashlight. You'll have to play around with the angles. The best way to use the flashlight is to cover most of the flashlight's "head" with an index card or something similar. Cut a small slit in the middle of the card, so that when it is attached to the flashlight, only a narrow beam of light will shine through. When that narrow beam of light hits the prism, it will refract into the spectrum.

Light and Color: Primary Activities



Activity

Diffraction Glasses

Pass out the diffraction glasses which bend or refract light. Have the children look toward a window, a fluorescent light and an incandescent light if possible. Have the children try to see the difference between the spectrum produced by the sunshine through a window, (CAUTION THEM NOT TO LOOK DIRECTLY AT THE SUN) and the spectrum from the different forms of light bulbs.

Share pg. 18 in *Light and Color* to display a spectrum from a prism.

Dichroic Sculpture

Share the dichroic light sculpture by Ray Howlett. (see info sheet) Discuss the different colors of light. Make sure the students look at the sculpture while moving from side to side. They can also try looking at it later with the diffraction glasses for another effect.

Reverse Chromatography

Get strips of coffee filters or white paper towels, about 1.5" wide and a little taller than the plastic cups you are using. Draw a pencil line about 1/2" from the bottom of the strip. Put a small dot of a felt tip pen on that line. Add about 1/2" of water to the glass. Place the strip of coffee filter or paper towel in the glass so that the end just touches the water. Tape the strip to the rim of the glass. Colors will rise up the strip from the small black dot. (If you leave it in too long, the colors will catch up and recombine.) The students can name their rainbow.

Color Wheels

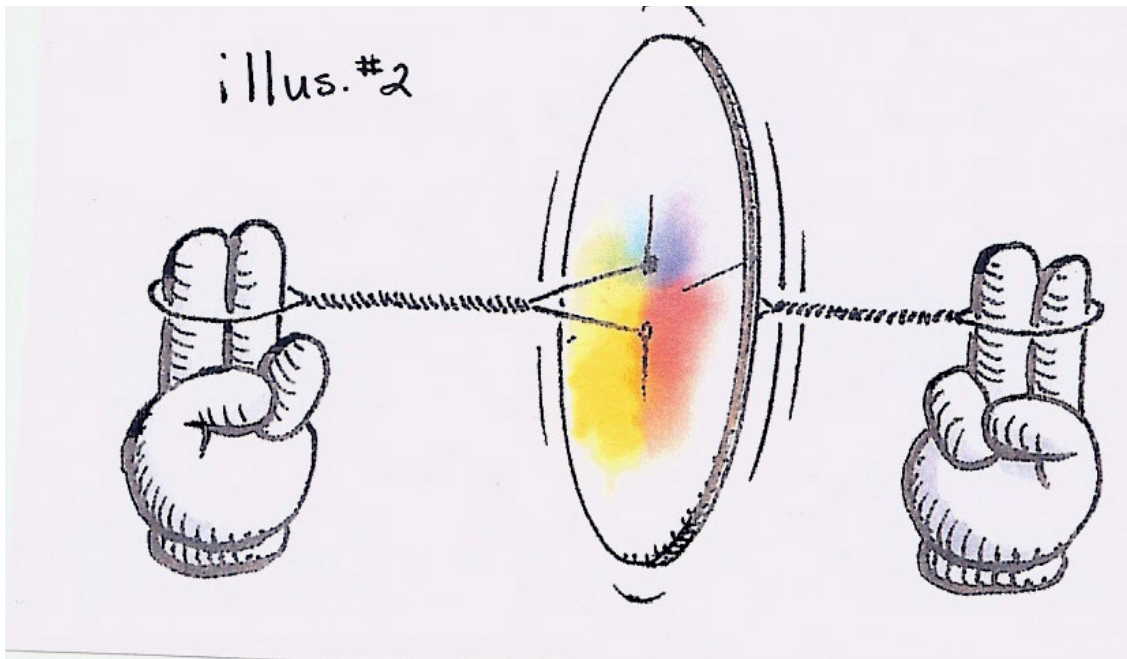
Have 3" circles already cut from tagboard or posterboard. They should be divided into 7 pie slices. (see sample) Color each pie slice a different color of the spectrum. (Indigo is

Light and Color: Primary Activities

deep blue in color...somewhere between blue and purple) Using a toothpick, poke a hole in the center of the circle. Put the toothpick through the hole. Position the circle in the middle part of the toothpick. Spin it quickly, like a top, and then let it go. Observe how the colors blend together and almost make a whitish color. (It will probably look more like a light gray.) You can also replace the toothpick with a pencil for spinning. And in that case, the circle could be larger than 3")

When the disk spins rapidly, your eyes cannot distinguish the separate segments, and so the colors appear to merge. If perfectly pure colors were used in the correct balance, the disk would appear white. In fact, this is almost impossible.

Alternative....This activity can also be done by poking 2 small holes near the center, running string through the holes and tying the ends together. You will have a circle of string that runs through the disk. Then hold the string in both hands with the disk in the middle. Twirl the disk around until the string is wound up. (see illustration #2)Then pull your hands apart and the disk will spin rapidly and the colors will go back to "almost" white.



Light and Color: Primary Activities

Intermediate Kit Inventory

Books	In	Out
<i>The Art Book</i>	<input type="checkbox"/>	<input type="checkbox"/>

Art Prints:	In	Out
Vermeer #1- 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Vermeer #2- 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Vermeer #5- 6 copies		
Mondrian- #17 - 6 copies of each	<input type="checkbox"/>	<input type="checkbox"/>
Mondrian - #19 - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet - #6 - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet - #7 - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet - #9 - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet - #10 - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet – 12 - 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet – Poplar Series- 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Monet – Japanese Bridge- 6 copies	<input type="checkbox"/>	<input type="checkbox"/>
Six (6) James Turrell skyspaces – 6 ea.	<input type="checkbox"/>	<input type="checkbox"/>

Copy Masters	In	Out
Monet's Palette	<input type="checkbox"/>	<input type="checkbox"/>
Mirrors Reflect worksheet	<input type="checkbox"/>	<input type="checkbox"/>
Mirrors That Multiply worksheet		
Inside My Eye diagram	<input type="checkbox"/>	<input type="checkbox"/>
5 optical illusion sheets	<input type="checkbox"/>	<input type="checkbox"/>
Krazy Kaleidoscope coloring sheet	<input type="checkbox"/>	<input type="checkbox"/>

Manipulatives:	In	Out
6 color wheels & lesson plan	<input type="checkbox"/>	<input type="checkbox"/>
1 tennis ball	<input type="checkbox"/>	<input type="checkbox"/>
6 protractors	<input type="checkbox"/>	<input type="checkbox"/>
28 mirrors	<input type="checkbox"/>	<input type="checkbox"/>
15 teddy bear counters	<input type="checkbox"/>	<input type="checkbox"/>
1 flashlight	<input type="checkbox"/>	<input type="checkbox"/>
1 set of red, blue & green cloth pieces	<input type="checkbox"/>	<input type="checkbox"/>
1 prism	<input type="checkbox"/>	<input type="checkbox"/>

Manipulatives:	In	Out
12 diffraction glasses	<input type="checkbox"/>	<input type="checkbox"/>
12 CDs	<input type="checkbox"/>	<input type="checkbox"/>
1 rainbow wheel	<input type="checkbox"/>	<input type="checkbox"/>
1 red light bulb in a socket w/cord	<input type="checkbox"/>	<input type="checkbox"/>
Colored acetate pieces	<input type="checkbox"/>	<input type="checkbox"/>
4 optical illusion cards- 6 copies of each	<input type="checkbox"/>	<input type="checkbox"/>
12 brushes	<input type="checkbox"/>	<input type="checkbox"/>
12 rulers	<input type="checkbox"/>	<input type="checkbox"/>

Light and Color: Intermediate Activities

Lesson#1- Pigment Colors

Materials in the Kit:

- 12 rulers
- 12 brushes
- 6 Color wheels
- Color Wheels lesson plan
- 2 Mondrian prints #17 & #19- 6 copies of each
- 6 Monet art prints #8, #10,#12, & the Poplar series- 6 copies of each
- 1 set of color templates

Materials Provided by Site:

Mondrian art activity:

- White paper
- Black markers
- Primary color markers, pencils or paints(red, yellow & blue)
- Pencils

Monet's Garden:

- Construction paper
- White tempera paint
- Water cups
- Colored chalk
- Pencils

Monet & Impressionism:

- Masking tape
- Scissors
- Sponges
- Tempera paint
- white poster board
- paper plates

Main Ideas:

1. The color wheel is a chart that shows how colors are related and sorted to make it easier for artists to mix the right colors.
2. The color wheel shows the relationship between primary, secondary and intermediate or tertiary colors, as well as complementary and analogous colors.
3. Color and light are used by every artist.
4. Piet Mondrian painted with primary colors.
5. Claude Monet painted with analogous colors.

Light and Color: Intermediate Activities

Intro

1st: Have the color templates ready. Ask the children to name the primary colors. (red, yellow & blue) Hold up the primary color template. Ask what happens when you combine the primary colors. (You get the secondary colors: orange, green & purple) If you combine a primary and a secondary color, what do you get? (intermediate or tertiary colors)

Pass out the color wheels. Explain how to use them. (See the instructions on the color wheels themselves) SEE COLOR WHEEL LESSON PLAN

Discuss how artists use color to create moods, show contrast, and create depth.

Discuss how colors have certain feelings associated with them. E.g. yellow- cheerful, happy.....blue- sad, cool, calm.....red- angry, excited, hot.

Take a colored object and compare how light or dark the color seems to be depending on whether it is in a dark place or out in the sunlight. Use objects that are handy and put them in dark and light situations. (An everyday example might be getting dressed early in the morning with very little light in the house and then being outside in the sunlight later and realizing that the colors you have on really don't match or clash.)

2nd: Display Piet Mondrian's prints # 17 & #19. Explain how he used mostly primary colors. (See the artist info sheet to share the facts that he completely changed the colors in his house/studio.) Ask if there are any emotions or feelings displayed in the prints. (The info sheet will tell you that Mondrian looked at the world mathematically and only saw basic shapes.)

Next share Claude Monet's art prints #8, 10, 12 & the Poplar series. Discuss how Monet tended to use analogous colors. Refer back to those on the color wheels. Explain Monet's style of painting....he put paint on the canvas without blending the colors. Brushstrokes and dabs of colors would be placed side by side. Monet called it "division of colors". When you stepped back from the canvas, your eyes blended the colors together. This is called impressionism because we only get the impression of the details...not the actual details themselves.

Also discuss how Monet made shadows. He used complementary colors i.e., violet, which is the complementary color of yellow, the color of sunlight. (Deepest shadows are tinged with green and purple.)

Activity:

Mondrian Style Painting

Introduce the fact that Mondrian found that the more he looked at trees, buildings and vases, the more he saw their basic shapes and colors. The children can do this too....tell them to squint their eyes while they are looking at something. And all of the details will disappear. They will only see shapes and colors. This is what Mondrian did.

Light and Color: Intermediate Activities

Give each child a piece of posterboard or tagboard. They will start by drawing lines on their paper using a pencil and ruler. They can put their lines anywhere they want, but here is a general guide.

They can divide their paper up by drawing 6 horizontal lines from one side of the paper to the other. The six lines can be drawn anywhere, with any kind of spacing that appeals to the children.

Next draw 4 vertical lines from the top to the bottom of the paper. Again, any kind of spacing is acceptable.

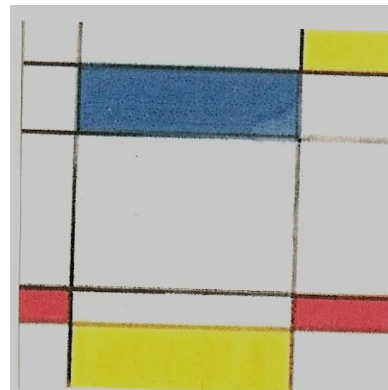
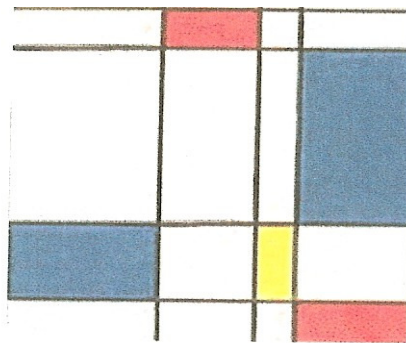
When the lines have been drawn, have the children use a black marker to darken them. Make some lines thick and some lines thin.

Now they should have a grid with lots of empty spaces.

Have them choose just a few spaces to fill in with the primary colors- red, yellow and blue.

Tell them not to overdo the color...leave a lot of white space, just like Mondrian did. The key is to keep it simple. (Keep Mondrian's prints on display.)

That's all there is to it! (see illustrations)



Monet's Garden- Tempera/Chalk Painting

Pass out a piece of construction paper to each student.

Have several cups of white tempera available. Each child may have a water cup also.

Lightly draw a landscape/garden with white chalk or pencil.

Paint an area about the size of a baseball with white tempera.

Dip a piece of chalk into the water dish and draw into the wet paint. If the paint dries, brush on a bit more.

Blend some related colors together for interest within the shapes.

Notice what happens to the colors as they mix in the paint.

The children will be able to produce some interesting "brush" strokes with the moistened chalk. They will be able to keep a clear palette, similar to Monet's.

Light and Color: Intermediate Activities

Monet and Impressionism

Give the students a long piece of masking tape. Tell them to cut it into strips that can be used to create a bridge, a trellis, a fence, or whatever they would like to have in their garden.

Give them a piece of white poster board. Create the design for the object by sticking the tape on their paper in the shape of the bridge, stairway, etc.

Have paper plates available with yellow, blue, pink, purple, green & white tempera paint...like a painter's palette.

Using sponges, have the children create sky, grass, water, trees, flowers, etc. by dabbing the colors on their paper.

Be sure to have the children paint over the tape too, No white paper should show.

When the paintings are dry, pull the tape off. It should appear that the objects are painted white and their garden blooms around it.

From far away the painting will appear more realistic. Close-up, it will appear as splotches.

Light and Color: Intermediate Activities

Lesson #2- Light and Color (See Primary Kit)

Materials in the Kit:

- Set of color templates
- 6 sets of color paddles (red, blue, yellow & green...a total of 24)
- 3 Mondrian art prints #18, 20 & 21- 6 copies of each
- 2 Monet art prints: *The Japanese Bridge* & *Waterlilies*.- 6 copies of each
- Color poem master
- My Many Colored Days* book

Materials Provided by Site:

- Old magazines
- Large construction paper
- Scissors and glue

Main Ideas:

8. The primary colors of pigments are red, yellow and blue.
9. The secondary colors are orange, purple, and green.
10. Colors can be divided into warm and cool colors.
11. All the colors we see come from just 3 colors.
12. Colors can express moods or feelings.
13. Piet Mondrian painted with primary colors.
14. Claude Monet painted with cool colors.

Intro:

1st: Begin a discussion about color. Who can name the primary colors? Why are they called primary? Display the primary color template.

What happens when you mix the primary colors together? What are these new colors called? Display the secondary colors template. Why are they called secondary colors?

Let the children experiment mixing the colors together with the color paddles.

2nd: Display Mondrian's art prints #18, 20 & 21. Ask the children: What primary colors do you see in these paintings? What secondary colors were used? Read the info sheet about Mondrian and how he changed the colors of his house/studio.

3rd: Display Monet's art prints of the Japanese Bridge & the 3 Waterlilies. What are the main colors that Monet liked to use? How do those colors make you feel? (relaxed, happy, peaceful) Those colors are called cool colors. What colors do you think would be considered warm colors? (red, orange, yellow) Show the color templates for analogous, warm and cool colors.

Light and Color: Intermediate Activities

4th: Read *My Many Colored Days*. Make a list of the feelings associated with different colors. E.g. feeling blue, green with envy, turning beet red, etc.

Activity

Shades of Blue

Discuss with the children the fact that two things can be blue (or red, green, yellow, etc), but still not be exactly the same color. Explain to children that there are different shades of the same color. Ask the children to look around the room and point out things that are different shades of the same color.

Next explain to the children that they are going to make a collage to show the different shades of a color. Distribute magazines and scissors. Tell the children to choose a color for their collage and have them look through the magazines for pictures with that color. They can work alone or with a partner.

Have them use the pictures to make a collage of that color on a large piece of construction paper. (You may want to have the construction paper match the color of their collage items.) Then help the children label their collages.

Discuss the collages and help the children develop descriptive vocabulary by encouraging them to use words and phrases such as dark red, bright yellow, dull green, pale blue, etc.

Have the children design their collages so that the pictures range from the darkest shade of a color to the lightest.

Color Poem

Pass out copies of the Color Poem worksheet and have the children write their own color poems.

Light and Color: Intermediate Activities

Lesson #3 - Color

Materials in the Kit:

Prism
12 Diffraction glasses
Rainbow wheel
Red lightbulb and socket w/cord
Colored acetate pieces
12 CDs
Red, green and blue cloth
The Art Book

Materials Provided by Site:

Poster board
Markers or crayons
Magazines
White paper
Toothpicks, pencils or string
Index cards

Main Ideas:

1. Sunlight is made up of light that contains seven colors.
2. Light contains electromagnetic waves.
3. Diffraction is the spreading or bending of light.
4. Most objects are visible to the eye by reflected light.

Intro

1st: How do we see color? One person who was curious about it was Sir Isaac Newton. In 1672, he looked at a narrow beam of sunlight shining through a prism. (display a prism) Newton observed that when light from the sun passed through the prism, it was split up into colored lights that had the colors of the rainbow: red, orange, yellow, green, blue, indigo and violet. Newton called this rainbow of colors a spectrum. He concluded that the sunlight was made up of light of many colors all combined, and explained that the prism separated the light into its parts.

Light is made up of electromagnetic waves of a certain length. Different colors of light have different wavelengths. For visible light, red light has the longest wavelength and violet has the shortest. When white light goes through a prism, the different colors that make up white light pass through the prism at different speeds. The shortest wavelength of light (violet) is bent more than the longest wavelength of light (red). Each color bends a slightly different amount.

Light and Color: Intermediate Activities

Activity

Diffraction Glasses

When you look at a light bulb in a dark room, you only see white light. Do you think there might be other colors there? (Pass out the diffraction glasses) Hold the glasses a few centimeters away from your eyes and look at light from a light source. Look towards a window for some natural light. (DO NOT LOOK AT THE SUN DIRECTLY!!!)

With an incandescent lightbulb, the spectrum you see will blend smoothly from one color to the next. With a fluorescent lightbulb, distinct lines will form at the colors red, yellow and green.

Explain that diffraction is the spreading or bending of light, which can occur:

- when light passes through the edges of things
- when light passes through narrow slits (like in the diffraction glasses). (Diffraction lenses are composed of many parallel grooves, cut into a plastic strip. These ridges affect the direction of the light as it passes through the grating.)
- when light is reflected from a shiny ruled surface, like a CD. Pass out the CDs and have the children observe the spectrums.

Color Wheels

If you've ever mixed paints, you know that mixing red and yellow will make orange. The primary pigment colors are red, yellow and blue. If you mix them all together, you get black. The primary colors of light are red, blue and green. When you mix them all together, you get white.

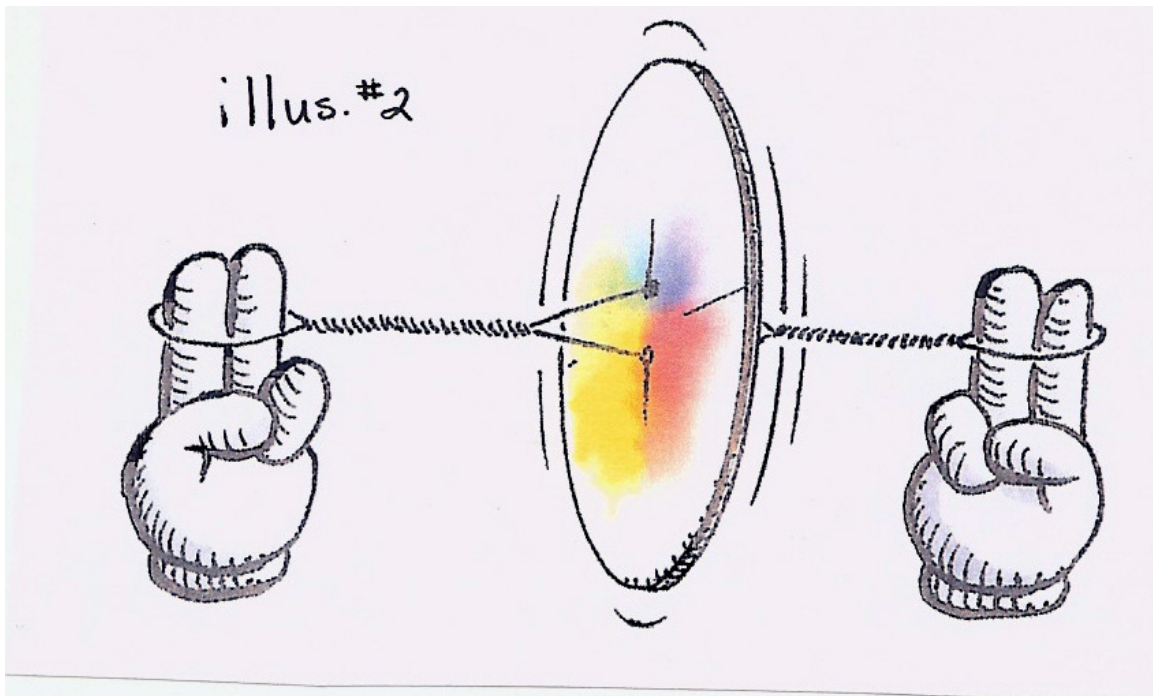
With prisms, diffraction glasses, or CDs, we saw that white light could be broken down into different colors. Can these colors be put back together again to form white light? Here is one way to make colors disappear and produce white.

Demo the commercial-made rainbow wheel, using a pencil through the center to spin it like a top. Then have the students make their own. It can be made 3 different ways:

1. 3 inch wheel with toothpick
 - a. Cut a circle 3 inches in diameter onto a white piece of posterboard.(You can have these cut out already for the children.)
 - b. Using a pencil, divide the circle into 7 pie slices.
 - c. Color each pie slice a different color of the spectrum. (Indigo is a deep blue in color, somewhere between blue and purple.)
 - d. Using a toothpick, poke a hole in the center.
 - e. Station the circle right in the center of the toothpick so that it will function like a spinning top.
 - f. Spin the toothpick quickly and then let go. Observe the colors.

Light and Color: Intermediate Activities

2. 6 inch wheel with pencil
 - a. Cut a circle 6 inches in diameter out of poster board.
 - b. Follow the instructions b. – c. above regarding coloring board.
 - c. Poke a hole with a pencil in the poster board.
 - d. Then spin the circle on the pencil, like a top.
3. 6 inch wheel with string
 - a. Cut a 6-8 inch diameter circle out of posterboard.
 - b. Follow the instructions b. – c. above regarding coloring board.
 - c. Poke a hole (with a nail) about $\frac{1}{2}$ inch from the center of the circle in the red and green wedges.
 - d. Thread a piece of string through the holes and tie the threads together, so that they have formed a loop.
 - e. Twist each side of the loop several times; then place the ends on your fingers. (see illustration).
 - f. Spin the disk by pulling the string in and out. Watch what happens to the colors.



What happened? When you looked at the spinning rainbow-colored disk, the colors disappeared and you only saw gray or white. As the disk spins, the colors appear to overlap each other because the image of the sections of the wheel are blended in your brain. It makes no difference if you spin the wheel clockwise or counter-clockwise, the

Light and Color: Intermediate Activities

colors are still blended in the same way. If you don't spin the wheel fast enough, you will see the individual colors.

What causes the color of an object?

Demo:

1. Turn off the overhead lights.
2. Place a piece of bright green cloth in the dark. What color does it seem to be?
3. Turn on the red light bulb with no other lights on. What color does it appear to be now? Turn off the red light and turn on the overhead lights.
4. Is the light that falls on an object important in producing color in an object?

Explain:

Most objects are visible to the eye by reflected light.

The color of light reflected from an object depends on 2 things: a) the color of light falling on the object and b) the color of light reflected from the object.

A green object reflects green light and absorbs red light.

When white light falls on a green object, the green component is reflected, therefore giving the appearance of green.

When red light falls on a green object, no light is reflected, therefore the object appears black.

Most things only let some colors of light bounce off of them.

We see colors as they bounce off. E.g., a red pepper looks red because only the red light bounces off of it.

Secret Messages

In this activity, the children will examine brightly colored pictures and decode secret messages to learn how colored filters transmit some colors and absorb others.

You will need colored cellophane or acetate covers, *The Art Book* and magazines.

Have the children begin by placing one colored acetate filter at a time over a picture. Notice how the colors are affected. With a red filter, a picture appears entirely in shades of red and black. (An ideal red filter only transmits red light and absorbs all other colors. A pure blue filter will transmit only blue light and absorb all others, etc.) The children can look at art prints in *The Art Book* or at pictures in magazines.

Have the students print their names on index cards, using a different color for each letter. Then have them look at their name through the different colored filters. Have the children determine how to write a secret message with a filter as a decoder.

Light and Color: Intermediate Activities

Lesson #4 Our Eyes and Light

Materials in the Kit:

- Inside My Eye master
- 2 illustrations of Monet's Japanese Bridge- 1923 & 1897- 6 copies of each
- 6 James Turrell's skyspaces- 6 copies of each
- Monet's palette- 4 copies
- 5 Optical illusions masters
- 4 optical illusion cards- 6 copies of each

Main Ideas:

1. Our vision is determined by the cornea, lens and retina in our eyes.
2. Claude Monet preferred painting outdoors, in pure light.
3. James Turrell makes huge light sculptures that you can sit inside of.
4. Optical Illusions trick our eyes.

Intro:

How Our Eyes See:

(Pass out copies of the diagram of the eye.)

Light enters the eye through the cornea. Since the cornea is curved, it bends the light inwards. (Close your eyes and lightly place your finger on the lid. Move your eye around and you'll feel the hard bump that is the cornea.)

Light then moves through the pupil, which is just an opening or hole in the iris, the colored part of the eyeball. The iris can change shape to make the pupil let in more or less light.

Behind the iris is the lens. The ciliary muscles are attached to the lens and can tighten or relax to make the lens rounder or flatter, changing its focus.

The light is focused onto the retina and at the back of the eyeball. The retina contains rods, which work in dim light...like in your bedroom at night. The rods see shades of black and white. The cones work in bright light. And they see colors. (Actually the cones see either red, green or blue- the colors of light.)

The Colors of Monet

Monet loved to paint outdoors and use pure light colors. In 1908, at age 68, Monet was affected by cataracts in both eyes and began to lose his sight. (Cataracts progressively make the cornea opaque, so light and color cannot reach the retina.)

Light and Color: Intermediate Activities

As Monet's cataracts developed, whites became yellow, greens became yellow-greens, reds and oranges. Blue and purple were replaced by reds and yellows. Details faded out and shapes became blurred and hazy.

When his vision altered, Monet went on working. He knew what colors he was using because they were always in the same order on his palette. (Display the picture of his palette.)

He claimed he saw everything through a mist. Monet was used to painting exactly what he saw. Gradually his paintings were invaded by reds and yellows. Blues vanished and details faded.

Pass out the 2 paintings of the Japanese Bridge. Discuss the difference in the colors, lack of details, etc that changed after Monet developed the cataracts.

Illusions of Light and Space

James Turrell's art uses light as a medium. This came from his Quaker upbringing when his grandmother told him to go into a Quaker meeting room and "greet the light." (See info sheet on James Turrell) Pass around pictures of James Turrell's art.

He creates optical structures by directing colored light. He calls them skyspaces. Visitors can actually enter the space and become part of the art. Turrell has said that his Skyspace works "apprehend, gather and hold the light for our perceptions".

As you look at his Skyspaces, think about the optical effects of the lighting.

Activity:

Optical Illusions

Images that fall on our retinas are 2 dimensional images. Our brain makes a judgment based on three factors. The first is what your eyes see. The second is the built-in pattern recognition of the brain. The third is your experience.

Sometimes your eyes send conflicting messages to the brain, which causes the visual information to be misinterpreted. This misinterpretation creates an optical illusion. Pass out the optical illusion- One Woman or Two? & discuss. Then do the same with the cylinders, circles and animal illusions.

Make copies of the 5 optical illusion sheets and pass them out to the children. Have the children enjoy discovering the tricks their eyes can play on them.