

COLOR

PLAY

Exploring the Art and Science of Color

An exhibit by Clifford Wagner Science Interactives, Inc.

Educators Guide

Presented by:

LYNX
exhibits

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Girl entering the Color Playhouse feature










EDUCATIONAL OBJECTIVES OF THE EXHIBIT









Color Play invites children of all ages to explore the art and science of color through whole-body experiences, hands-on interactives and opportunities for fantasy play. This joyful, creative exhibit engages all ages – kids through adults. Younger children can simply enjoy the rich sensory experiences it provides, while older children can experiment and investigate. Directly connected to everyday life, it shows guests how four colors of ink create all the colors in a magazine or on a cereal box, how three colors of light create all of the colors on a television screen, and makes links to one of the most fundamental concepts in physics.

The following major educational concepts are explored within the exhibit:

-  **White light is made of colors.** This concept is presented in the *Color Playhouse*, the *Yellow Light Room*, the *Rainbow Room*, and in *A Prism's Rainbow*.
-  **Mixing light is additive color mixing.** This concept is seen in *TV Colors* and *Color Dance*.
-  **Mixing paint or stacking filters is subtractive color mixing.** Add paint or stack another filter and watch the color change toward black. Seen in *Four Color Printing*, *Color Windows*, *Color Creations* and *Pigment Palette*.
-  **Perception.** What we perceive is the result of information received from the senses and processed by the brain. This is observed in the *Yellow Light Room*, the *Stroop Test* and *After Images*.

DESCRIPTION OF EXHIBIT ELEMENTS

-  In the YELLOW LIGHT ROOM, guests learn that colors change dramatically when yellow light is on instead of the white light – true colors can only be discerned in white light because it contains all the colors of the spectrum.
-  The STROOP TEST illustrates the difficulty of trying to read aloud words for colors when they are printed in the “wrong” color.
-  Ultraviolet light makes invisible things appear or objects change color in the BLACK LIGHT ROOM because the UV energy gets re-radiated back as visible light.
-  THE RAINBOW ROOM shows how white light contains all the colors of the spectrum using a rotating chandelier with 12 white lights projected at a reflective holographic material. Guests learn how rainbows are created while sitting in comfortable seats. Children will enjoy the reading corner.
-  Colors look different seen through the colored filters of the COLOR WINDOWS because true colors can only be seen in white light.
-  THE NEON SWIRL is an interactive sculpture that displays bright neon lights that flash on and off in sequence when guests turn a crank.
-  At the POLARIZED WINDOW, guests create a rainbow of colors by twisting plastic shapes to create visible stresses in the polarized filters.
-  Guests lift a bubble frame to make a SOAP BUBBLE WINDOW, enjoying the rainbow of colors that stand out against the solid black background.
-  COLOR DANCE invites full-body play under red, green and blue theatrical spotlights thrown against a large white wall.

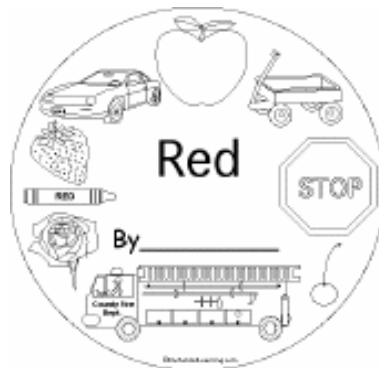
-  At the station A PRISM'S RAINBOW, white light can be split into a rainbow and then re-combined into white light.
-  TV COLORS illustrates for guests how only three colors of pixels combine to create all of the colors on a television screen.
-  At the COLOR CREATION station, guests can combine translucent colored plastic tangram pieces on light table to see how new colors are created where the pieces overlap.
-  PICTURE PRINTING shows guests how color pictures are made by rolling the cyan, magenta, yellow and black cartridges across paper to make a full-color picture appear.
-  COLOR SPINNERS is a table of fixed position tops that guests can spin by hand to create a rainbow of color and effects.
-  Guests can create a COLOR STORM by cranking the pedals of an upside down bicycle to make a riot of colored feathers fly around inside an enclosed chamber.
-  The BIG KALEIDOSCOPE is big enough for the whole group of kids to see the colorful patterns mix and change as the crank is turned.
-  At the AFTER-IMAGES station, play with the eye-brain connection by staring at a number of full-color images then shifting the gaze to a plain white surface to see what happens.

SUGGESTED PRE- AND POST-VISIT ACTIVITIES

Grades Pre-K through 3

WHAT IS THAT COLOR?

Using paper plates or sheets of blank white construction paper, have students select a color, then write or draw pictures of things in nature or around the home and classroom that are that color. For example, PURPLE could be grapes, eggplant, flowers, plums, jelly, purple crayons, etc.



Teacher could assign each student a different color, or form small groups and have students work together to come up with items to draw. After all groups have finished, stand up to share their pictures show-and-tell style. When all groups/students are finished, hang projects on the wall in the order of the colors of the rainbow.

Idea courtesy of EnchantedLearning.com

LABEL THE COLOR WHEEL

A color wheel shows the relationship between the colors. Label and color the primary, secondary, and tertiary colors on the color wheel on the next page.

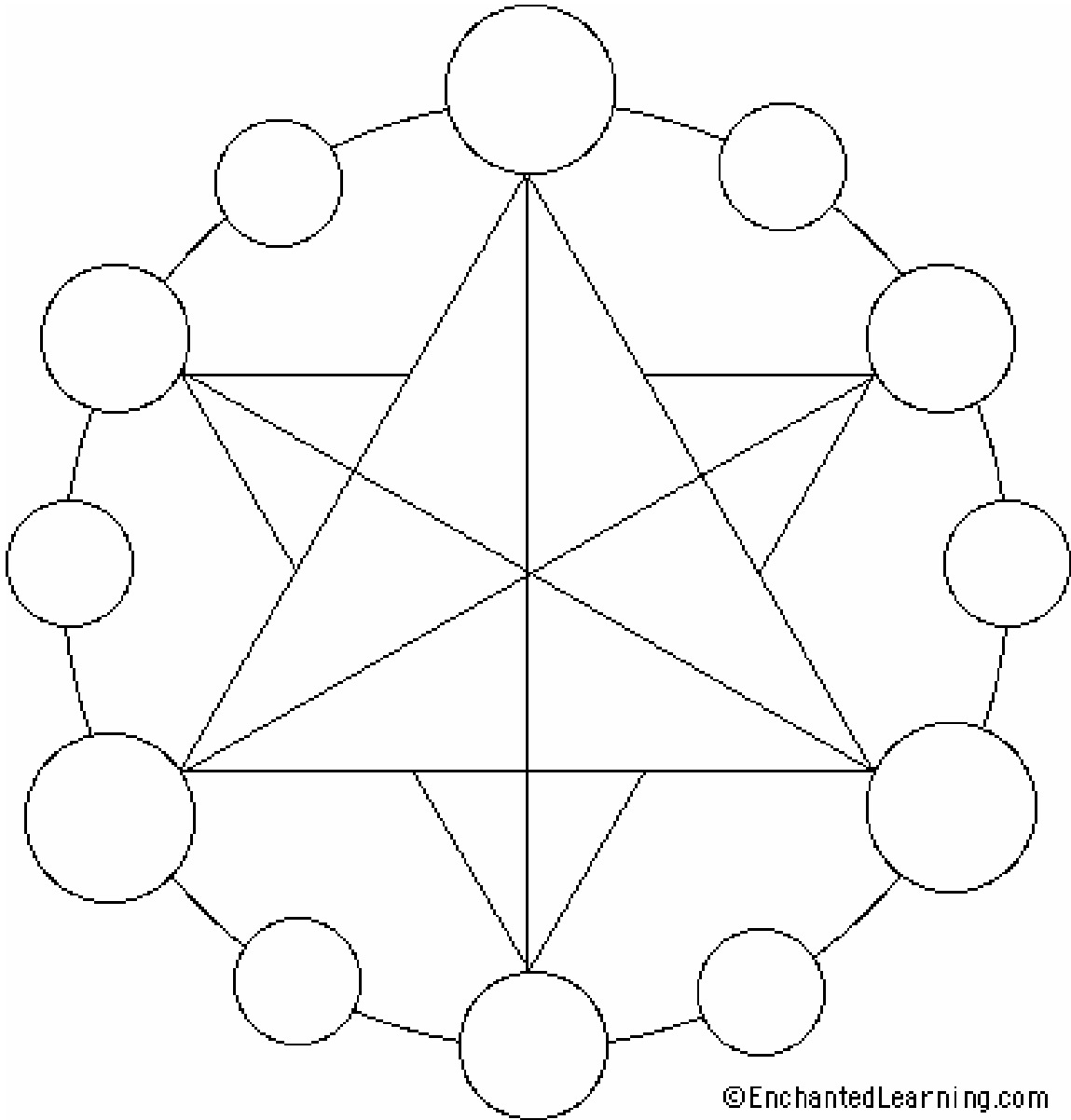
The three primary colors (**red**, **yellow**, and **blue**) cannot be made by mixing two other colors. On the color wheel, the primary colors are located on the points of the main triangle. Put red at the top.

The three secondary colors (**orange**, **green**, and **violet**) are each a mixture of two primary colors. On the color wheel, the secondary colors are located on the points of the upside-down triangle, between the colors they are made from.

The six tertiary colors (**red-orange**, **red-violet**, **yellow-green**, **yellow-orange**, **blue-green** and **blue-violet**) are made by mixing a primary color with an adjacent secondary color. On the color wheel, the tertiary colors are located between the primary and secondary colors they are made from.

Idea courtesy of EnchantedLearning.com

LABEL THE COLOR WHEEL (use this color wheel for the activity)



SUGGESTED PRE- AND POST-VISIT ACTIVITIES

Grades 4 and above


SIGHT AND LIGHT

Learn that the *eyeball* is shaped like a sphere; the *pupil* is a small hole in the front and middle of the eye that lets light into the eye; the *retina* is at the back of the eyeball and the images we see are formed on the retina; nerve fibers come together from all parts of the retina to form the *optic nerve*, which carries visual images to the brain; and that the images that appear on the retina are upside down; when the brain receives the images, it “turns” them right-side up.


For each student, or group of students, you will need the following materials:

- ✚ Round, clear glass bowl with water inside
- ✚ Sheet of cardboard covered with black paper
- ✚ Sheet of cardboard covered with white paper
- ✚ Small table lamp without a shade or a candle and a match


1. Review with your students what they have learned about the human eye and how it receives visual images. Tell the class that they are going to make models of the eye that may reveal to them something surprising about the way we see.
2. Divide the class into groups, giving each group the materials listed previously (see Materials). (If you can obtain only one round glass bowl, let groups take turns using the materials.)
3. Instruct students how to make their model eyes, or reproduce the following set of instructions and give a copy to each group:
 - ✚ Make a small pencil hole in the middle of the black cardboard.
 - ✚ Stand the black cardboard against one side of the bowl and the white cardboard on the other side, opposite the black.
 - ✚ Turn on the lamp (or light the candle), and place it so it is shining through the hole in the black cardboard.
 - ✚ Darken the room as completely as possible.

 Move the white cardboard from side to side until an image of the lamp or candle appears on it.

4. After students have created their models, explain how each part of the model corresponds to a part of the eye:

 The hole in the black cardboard represents the pupil, a small hole in the front of the eyeball that lets light into the eye.

 The round bowl of water represents the eyeball.

 The white cardboard represents the retina, the part of the eye that receives images and sends them to the brain via the optic nerve.

5. Ask students why the image they see on the “retina” is upside down. Explain that the curvature of the eyeball (or the round glass bowl) inverts the image by bending the light as it comes through. The image that forms on the retina in the back of the eye is also upside down, but the brain interprets the image so that it is seen right-side up.

6. Have each student produce a labeled diagram of the model indicating which part of the eye each part of the model represents.

DISCUSSION TOPICS:

1. Explain the difference between light reflection and light refraction, and provide examples of each of these processes in action in everyday life.

2. As scientists have made clear, light is a strange phenomenon. On some occasions, it acts as if it were made up of individual particles called photons. On other occasions, however, it acts as if it were made up of waves. Explain the difference between these ways of imagining light.

3. Compare and contrast how a camera works with how the human eye works. List the mechanical parts that would be similar and the parts that would be different.