

Bay Area Scientists in Schools Presentation Plan

Lesson Name Hidden Colors

Presenter(s) Chemical Biology Graduate Program Students

Grade Level K Standards Connection(s) Physical Science: Describing objects' physical properties (color)

Next Generation Science Standards: N/A

<i>Science & Engineering Practices</i>	<i>Disciplinary Core Ideas</i>	<i>Crosscutting Concepts</i>
<p>Planning and Carrying Out Investigations</p> <p>Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</p> <p>With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)</p> <p>Analyzing and Interpreting Data</p> <p>Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</p> <p>Analyze data from tests of an object</p>	<p>ETS1.B: Developing Possible Solutions</p> <p>Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to K-ESS3-3)</p>	<p>Cause and Effect</p> <p>Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1),(K-PS2-2)</p>



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Common Core Standards:

ELA/Literacy:

RI.K.1 With prompting and support, ask and answer questions about key details in a text.

RI.K.1.A:10. Actively engage in group reading activities with purpose and understanding.

a. Activate prior knowledge related to the information and events in texts.

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

Mathematics:

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.

MP.4 Model with mathematics.

MP.2 Reason abstractly and quantitatively.

FOSS Connections:

Kindergarten Module: *Trees*

Investigation 2: *Leaves*

Part 3: *Comparing Leaves*

Teaser: Colors are all around you every day, but what makes up those colors? Students join little blue and little yellow from Little Blue and Yellow by Leo Lionni in learning how colors mix, and additionally gives kids an opportunity to see how colors separate with experiments they can repeat at home.

Objective: The students should be able to identify primary and secondary colors, and describe what will happen when they are mixed or separated.

Vocabulary/Definitions:

- o **Primary Colors:** red, yellow and blue. These can be combined to make all the colors you see.
- o **Secondary Colors:** colors made from mixing two primary colors. Orange, green, and purple.
- o **Chromatography:** method of separation, we will use it for colors.
- o **Prism:** something that makes a rainbow.

Materials:

What will you bring with you?

- o Coffee filter paper (pre-cut)
- o Markers (water soluble, separate well)
- o Dixie cups
- o Prism
- o Circles printed on cardstock divided into six slices with the spaces for red blue and yellow labeled
- o Watercolors
- o Paintbrushes



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- o Newspaper for tables
- o Colored films in primary colors (red, blue, yellow)

What should students have ready?

- o pencils

Classroom Set-up: *Student grouping, Power/Water, A/V, Light/Dark, set-up/clean-up time needed*

- o Class divided into five or six groups
- o Water available
- o Need space for coloring wheels to dry

Classroom Visit

1. Personal Introduction: ___5___ Minutes

We are scientists at the University of California at Berkeley. Each person introduces themselves with name and favorite color.

Topic Introduction: ___10___ Minutes

What questions will you ask to learn from students? Big Idea(s), vocabulary, assessing prior knowledge...

- Have a few students raise their hands and say their favorite colors.
 - write them on the board
- Are there any we didn't name?
- Use the prism to show them a rainbow with all the colors. Name each color and write the remaining ones that aren't on the board.
- What are primary colors? Primary colors can be mixed together to make secondary colors. Can anyone name the primary colors in our rainbow?
- What are secondary colors? Secondary colors are made by two primary colors. Can anyone name the secondary colors in our rainbow?
- Color Mixing (use flashlights with colored films at the end to demonstrate color mixing)
 - What do you think will happen when I mix these colors?
 - Demonstrate mixing of red, blue, and yellow with flashlights
- Read Little Blue and Little Yellow (Little Blue and Little Yellow become friends and when they hug or when their family hugs they turn green – this is an example of mixing 2 primary colors that we'll do later with paint. When they cry they separate back into blue and yellow and we can see this with the chromatography
- What colors combine to make green? Purple? Orange?

2. Learning Experience(s): ___20___ Minutes

What will you do, what will kids do? Demonstrations, hands-on activities, images, games, discussion, writing, measuring... Describe in order, including instructions to kids.

- We are going to do an activity called chromatography to try and separate the colors in these markers.



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- Coffee filter chromatography:
 - Put the students into small groups and give each group a strip of coffee filter paper and a Dixie cup with a small amount of water. Each group gets a different color marker.
 - BASIS volunteer guides students in how to draw a line on the bottom of the paper and how to set the paper in the cup (Have them fold the piece of paper in half and stick the end in the cup of water. Emphasize that the paper should not be disturbed – only observed.)
 - Watch the colors move up the paper!
 - As everyone to predict what will happen with their strip

- One person from each group can present their results to the class
 - What did you think would happen? Which colors separated? What colors did they separate into? So which colors are primary are which are secondary? (Review definition of primary & secondary colors)

- Coloring: now we're going to practice mixing colors together
 - Put newspaper down on tables (if you haven't already) for easy cleanup
 - Each student gets a cardstock circle and a paintbrush, and each table gets a set of watercolor paints.
 - Tell the kids to play with mixing and not mixing colors together:
 - What happens when you paint just one color?
 - What happens if you paint two primary colors in a section?
 - What happens if you paint two secondary colors in a section?

3. Wrap-up: Sharing Experiences

_____10_____ Minutes

Putting the pieces together – how will students share learning, interpret experience, build vocabulary?

- Everyone should rinse their paintbrushes and put them away, close up their paints, put the newspaper in the recycling, then sit quietly and wait for the next instruction.
- Ask a few students to show their coloring page and identify the colors on it. What colors did they make by mixing?
- Review the vocabulary words
- Ask students to remind you which colors make green/orange/purple

4. Connections & Close:

_____5_____ Minutes

What else might kids relate this to from their real-life experience? How can they learn more? Thanks and good-bye! Clean-up.

- What other colors can you think of that we didn't talk about today? Do you think they are primary or secondary...or something else entirely? How could you find out?

Total: 50 – 60 Minutes



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Differentiated Instruction

English Learners: Repeat directions, if necessary, and physically model how to mix and separate colors. Vocabulary words can be visually demonstrated and/or redefined in very simplistic terms. Give many examples of familiar objects with the same colors.

Advanced Learners: Have students practice mixing other colors, e.g. secondary colors, and write/draw their observations.

Follow-up - After Presentation

ELA Activity:

Students respond to the following journal prompt:

-Write a letter to a friend explaining what you learned about colors. Where else have you seen rainbows? Draw a picture with your letter.

Read:

- Take a Walk on a Rainbow: A First Look at Colors by Miriam Moss

http://www.goodreads.com/book/show/1590635.Take_a_Walk_on_a_Rainbow

- Color Dance by Ann Jonas

<http://www.harpercollins.com/books/Color-Dance-Ann-Jonas/?isbn=9780688059903>

Mathematics Activity:

-Create Spinning Color Wheels (described below) and have students spin and graph the frequency of colors.

Additional Activities:

- Students can also separate other dyes and color mixtures – e.g., Chromatography with pureed leaves/spinach (baby food?): (something to try at home)

- candy separation: <http://chemistry.about.com/od/chemistryexperiments/ht/candychroma.htm>
- with leaves: <http://chemistry.about.com/cs/howtos/ht/paperchroma.htm>
- t-shirt design: <http://www.life.illinois.edu/boast1/sciencelessons/chromatography.htm>

- See your own rainbow – cut a slit in a piece of paper and look to see a rainbow



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Spinning Color Wheels

Materials:

- Pushpin
- Pencil eraser
- ruler
- scissors
- markers or crayons in all the ROY G BV colors: red, orange, yellow, green, blue, violet
- uncoated white paper plate (dessert or lunch size)

Activity Directions:

1. Trim the edge of the plate off to create a flat, white circle.
2. Divide the circle into 6 equal sections, using the ruler and a pencil.
3. Color each section a different ROY G BV color.
4. Pull the eraser out of the top of the pencil.
5. Color side up, stick the pushpin through the circle's center and into the eraser.
6. Holding the handle of the pushpin, spin the circle on a hard surface like a top.
7. What color(s) do you see? Does it matter which direction, or how fast, you spin the wheel? Does it matter what colors are next to each other?
8. Have you ever held a prism or crystal up to the light to create a rainbow? In this activity, you just reversed the process. When you combine all the colors, they appear white, or a yellow-ish-white like many light bulbs.



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