Experiments in Tea Dyeing

Grades K–2

I. Introduction

Experiments in Tea Dyeing will explore how humans utilized plants to dye textiles before the invention of the synthetic dyes that are used today. Students will make predictions about their dyeing, dye squares of cotton muslin with tea, and create a chart with their tea-dyed squares. You can use this lesson as either preparation for your class' visit to the Huntington, or as reinforcement of the trip afterwards.

II. Objective

- To develop an appreciation of the botanical sources that were once used for creating colorful fabrics and understanding the processes involved in dying with plants.

III. Standards Assessed

Social Sciences

History-Social Sciences Content Standards for California Public Schools Kindergarten Through Grade Twelve, California State Board of Education (2000)

"Learning and Working Now and Long Ago"

- Students understand how people lived in earlier times and how their lives would be different today (e.g., getting water from a well, growing food, making clothing, having fun, forming organizations, living by rules and laws) (grade K, 6.3).

Earth Sciences

Science Content Standards K–12, California State Board of Education (2000)

- Students compare and sort common objects by one physical attribute (e.g., color, shape, texture, size, weight) (grade K, 4.d).

- Students know rock, water, plants, and soil provide many resources, including food, fuel, and building materials, that humans use (grade 2, 3.e).

Math

Mathematics Content Standards for California Public Schools K–12, California State Board of Education (1997)

- Students will represent and compare data (e.g., largest, smallest, most often, least often) by using pictures, bar graphs, tally charts, and picture graphs (grade 1, 1.2).

IV. Background

During the *Discovering Plants* program at Huntington Botanical Gardens, your class will be read the book *Weslandia* by Paul Fleischman and explore the Herb Garden. Like in *Weslandia*, the Herb Garden is a good place to discover that many items we use in our everyday lives come from plants. The garden is organized into different sections by type of use: herbs for flavoring, fragrance, medicines, cosmetics, or dyes. (If you are considering doing this lesson as follow up to your Huntington visit, before you leave the mint station, ask if you can see the *Camellia sinensis* tea plant.)

In this lesson, we will focus on the use of plants for dyeing fabrics. The garden has two groups of plants that are important to this lesson: dye herbs and tea herbs. Both dye herbs and tea herbs can be used to color fabrics. Colorful textiles are not a new invention, although the techniques for dying fabric have changed over the years. While today synthetic dyes are primarily used to color clothing and fabrics, in the past natural dyes were used to create color. Natural dyes are derived from many sources including leaves, roots, bark, nuts, flowers, and fruit. This lesson will explore using black, green, and herbal teas as natural dyes.

According to legend, people in China have made tea since about 2700 BC. For millennia, it was a medicinal beverage obtained by boiling fresh leaves in water, but around the 3rd century AD, it became a daily drink, and tea cultivation and processing began. Today tea is grown commercially in India, Sri Lanka, China, Japan, Indonesia, and elsewhere. The beverage is made from the leaves and buds of the tea plant, *Camellia sinensis* (a close relative of garden camellias). The leaves may be fermented (black tea) or left unfermented (green tea).

Many other teas can be made from different plants, such as hibiscus, peppermint, and chamomile. These drinks are often called “herbal teas” since they are not made from the tea plant, *Camellia sinensis*. Herbal teas have been enjoyed for centuries around the world and are popular for their taste, calming effect, and medicinal qualities.

V. Materials Needed (per student)

- tea bags: black tea like Lipton or Tetley, green tea, hibiscus-based herbal tea like Red Zinger, or Celestial Seasonings Fruit Sampler (at least one tea bag for each student)
- unbleached cotton muslin cut into 3" squares (at least one square for each student)
- 8 oz. cup (for each student)
- 4 oz. water (for each student)
- stir sticks

VI. Lesson Activities

Safety and Environmental Concerns

Although hazards with this exercise are minimal, do not distribute hot water to students. The water should be tepid when given to the students. The time allowed for steeping should be long enough for the water to cool to the appropriate temperature. In addition, children should be instructed not to drink the tea that is to be used to dye the fabric.

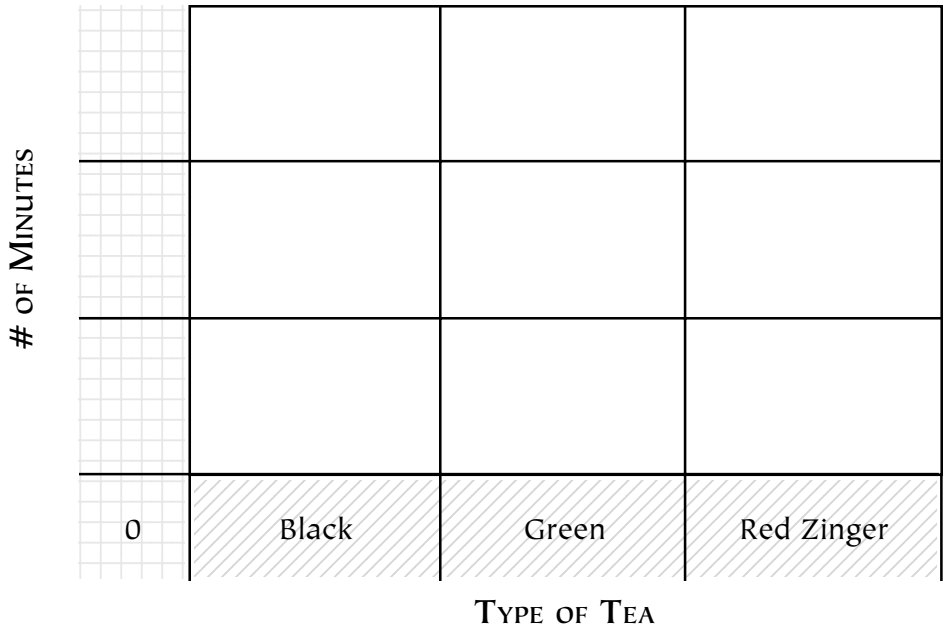
Preparation

1. Prepare cotton muslin by cutting into 3" squares (or desired size).
2. Microwave water, about half a cup for each student, until it comes to a boil, or bring water to a boil in a pot. The warm water speeds the steeping process, and allows for better color saturation. A half a cup of water is recommended for each teabag in an 8 oz. cup; more water will dilute the tea.
3. Steep tea bags for approximately 5 minutes so that the dye batches are ready for the students, but do not prepare too early or the tea will get cold and will not dye as well.
4. Discard (or compost!) used tea bags.

Procedure

1. *If you use this as a pre-visit activity*, begin the lesson by telling your students that they will soon be visiting the Herb Garden at the Huntington. Discuss what herbs are and how some can be used as dyes to color fabrics.
2. *If you use this as a post-visit activity*, ask the students about what items they remember Wes (from *Weslandia*) making from his plant. The students may also recall there were many plants in the Herb Garden used for dying.
3. If you have a copy of *Weslandia*, turn to the illustration showing the loom, and point out the contrasting thread Wes has used to create a design in his fabric. How did Wes dye his fabric?

4. Explain that you are going to dye some fabric with different types of tea. Walk the children through a discussion of the vocabulary and the activity. (What is tea, dye, etc.?)
5. Ask them to make predictions about what colors might result from the tea dying (e.g. cranberry would be pink or red).
6. Ask the students predict how long the squares will have to soak in the dye for the color to be absorbed. How does length of time effect how light or dark the squares come out? (You could also compare squares soaked in cold water and hot water: explain how heat energy changes the outcome, giving the dye more energy to penetrate the fabric.)
7. Dye some squares together as a class to test their predictions. (Minimum time recommended is 5 minutes, but optimum color saturation will occur around 30 minutes. You may want to have some set up before class as examples.)
8. Have the students determine how long their squares will stay in the dye (i.e., 1 minutes, 5 minutes, 10 minutes, an hour?).
9. Have the students use a ball point pen to label each square with the dye used and the length of time the square will be dyed (ex. 'G' for green tea, and '10' for 10 min.).
10. Place cotton squares (up to 3 squares per half cup of water) into the steeped tea for desired length of time, stirring occasionally with stir sticks. Make sure each square is completely wet.
11. While the squares are dying, create a class chart by labeling the X-axis with the type of tea and the Y-axis with minutes (see example below).
12. After the designated length of time, remove the squares and evaluate color saturation. (Squares take approximately 2 hours to completely dry, color may lighten as they dry.)
13. Once the squares are out of the dye, stick them to the chart at the correct places. Allow time for students explain the results and any patterns that develop. (Did length of time have an effect on depth of color? Did the teas produce the color the students expected?)



VII. Discussion Questions

1. Why would people want to dye fabric?
2. How do you think people learned about what plants dye fabric?
3. What is the difference between natural and synthetic/man-made?
4. How could you determine if a plant might be a good natural dye?
5. Why are plants important to people?
6. How do you use plants everyday?

VIII. Extension Activities

1. Parts of a plant: Talk about and identify the parts of a plant: stems, leaves, and roots. Explain leaves are used to make true teas from the camellia plant. If you used black and green teas to dye your tea squares remind the students these teas come from the tea plant, *Camellia sinensis*. Herbal teas you may have used are made from leaves, fruits, flowers, or roots. "Dissect" a tea bag after you discuss the parts of a plant. Revealing the contents of a few tea bags, and reading the ingredients of the tea will reinforce the plant parts they just discovered. Magnifying glasses will enhance this activity, but are not necessary. (You could do this while your fabric is soaking.)

2. Piecing a quilt: Consider creating a quilt with the tea-dyed squares that the children create. This could be a class, group, or individual endeavor. Glue or tape dried squares to a paper backing creating a pleasing pattern. Group quilts can also be placed together to create one large class quilt. Twelve 3" squares are needed to create a 9 x 12" quilt (standard sized construction paper).

3. Color a quilt: Give students a photocopied grid (attached) to color, having them pretend to create a quilt with natural dyes from plants like tea, grass, blueberries, etc. For example, their red crayon could be dye from a red hibiscus flower. Have them choose crayons or markers in the colors they would like to create their quilt pattern. See the list below for ideas. You many want to recommend them choosing only two or three colors to create their pattern.

    - Yellow—onion skins, turmeric, chamomile, sage, annatto, zinnia, marigolds, safflower, green tea
    - Orange—carrot peels, beet juice, goldenrod
    - Green—spinach, kale, parsley, red onion skins, rosemary, thyme, carrot tops
    - Lavender—blackberries, red cabbage, blueberries, grape juice concentrate
    - Brown—black tea, coffee, pine cones, acorns, pecans, tea leaves

4. Have a tea party!!! Allow your students to sample some teas. Distribute clean cups with warm water and permit the children to select the tea variety they would like to try. Then have them steep their tea. Conduct a poll of how many of your students have had tea before vs. how many have never tried the beverage. Cookies are always a nice accompaniment to tea!

Vocabulary

dye	a substance used to color materials
fabric	a cloth produced especially by knitting or weaving fibers
herb	any of various often aromatic plants used in medicine or as seasoning
natural dye	dyes of plant and animal origin
synthetic dye	dye that is from a man-made source, not natural
tea	an Asian evergreen shrub with glossy leaves or the dried processed leaves of this plant, steeped in boiling water to make a beverage; any similar drink prepared from the leaves of other plants

COLOR-A-QUILT

Name _____

Color a quilt with crayons. Colors can be made from these plants. Choose the plants you like to create your own patterned quilt:

Red: Hibiscus flowers
Pink: Cranberry fruit
Orange: Carrot peels
Yellow: Onion Skins
Green: Spinach leaves
Blue: Blueberry fruit
Purple: Grape juice
Brown: Tea or Coffee

Which plants did you use to create your quilt?

_____

_____

Bibliography

Recommended Literature

Buchanan, Rita. 1999. *A Weaver's Garden: Growing Plants for Natural Dyes and Fibers*. Dover Publications.

An adult's guide to growing plants for making dyes.

Dean, Jenny, et al. 1999. *Wild Color: The Complete Guide to Making and Using Natural Dyes*. Watson-Guptill Publications.

An adult beginner's guide to making natural dyes from household goods and plants from the yard.

Eversole, Robin. 1999. *Red Berry Wool*. Albert Whitman and Company.

Lalo the lamb wants a bright red sweater like the one the shepherd boy wears. He tries in vain to wash, spin, and dye his own wool. As each attempt gets him into difficulty, the boy is there to rescue him.

Fleischman, Paul. 1999. *Weslandia*. Candlewick Press.

Wesley, a misfit, decides to create his own garden, food, clothes, and world in his backyard. Naming it Weslandia, he succeeds brilliantly in making friends while doing it.

Liles, J.N. 1990. *The Art and Craft of Natural Dyeing: Traditional Recipes for Modern Uses*. University of Tennessee Press.

A complete resource for natural dyes.

Web sites

Plant Dye Paints
http://www.kinderart.com/painting/plantdye.shtml

A grade 2-6 lesson in making dyes from vegetables.

In Pursuit of Tea
http://www.inpursuitoftea.com

A great site that offers information and pictures of different types of tea, also sells quality loose leaf teas.

The Tea Council
http://www.tea.co.uk

The Council (based in Britain) explores the world of tea, details on history, processing methods, varieties and flavors, brewing techniques, and health facts.