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Level: Grades 3-5

Subjects: English Language Arts, Math, Science, Social Studies

Skills: Listening, following directions, cooperating, collaborating, comparing similarities, explaining, observing, creating, developing vocabulary

Lesson 5: A Colorful Life

Activity: Dying Yarn

Mary Dickinson Bird, PhD, author - Created through the MAITC Ag Literacy Grant made possible by the Ag License Plate



Using natural materials for dyeing yarn or cloth can be both fun and surprising! This activity uses only plant materials, including leaves, roots, seeds, bark, and berries along with some safe and familiar kitchen ingredients, to make dye baths that transform handspun yarn or woven cloth.

NOTE: All the dye materials used in this activity are edible. However, students should be cautioned against putting their hands in their mouths or near their faces, for three reasons:

1. The cleanliness of the fibers is not guaranteed.
2. Some students might have undiagnosed sensitivities to the spices or other dyestuffs.
3. Employing safe lab practices provides useful preparation for future investigations in which substances might be less benign.

For this activity you will need:

ground spices: turmeric and paprika are included in the kit (You might also consider trying cinnamon, mustard, black tea leaves, purple cabbage, raspberries or blueberries, spinach, parsley, or other colorful and safely edible plant materials)

white vinegar

alum (found in the herb and spice aisle or with canning and pickling supplies)

cream of tartar (found in the herb and spice aisle)

pot

cooking spoon

un-dyed wool yarn or white cotton string (You can also use small squares of white cloth or handkerchiefs.

However, newly purchased commercial fabric should be pre-washed to remove any factory treatments such as chemical sizing.)



What to do:

1. Brew the dye baths.

This should be done a day ahead, since it takes some time:

Proportions are: 1 oz spice / 1 quart water
 1 cup chopped purple cabbage / 1 quart water
 1 cup black tea leaves, parsley, or berries, etc / 1 quart water

For spices and all plant materials EXCEPT cabbage, mix ingredients and simmer for one hour.

For cabbage, chop and steep overnight in the water. The next day, boil for one hour. (Cabbage takes time and effort, but the results are AMAZING and provide a visual and very memorable chemistry lesson!)

After brewing, strain out tea leaves and cabbage pulp. Powdered spices may be left in the dye-bath, because they will be rinsed out later.

2. Choose and add the mordant.

Animal and soy (protein) fibers and plant (cellulose) fibers react differently to dyes and to the temperature of the dye baths. In general, protein fibers take color better from a simmering acid bath, while cellulose fibers are more successfully dyed in a slightly warm, alkaline bath. However, there are exceptions to this! Here are the “tried and true” formulas recommended for classroom use:

- 1 qt spice/tea dye with 2 teaspoons alum and ¼ teaspoon cream of tartar
- 1 qt red cabbage dye with 2 teaspoons alum and ¼ teaspoon cream of tartar
- 1 qt red cabbage dye with ½ C vinegar

3. Decide whether you will use heat to keep your dye bath warm.

If your classroom has safe access to a hot plate, crock-pot, warming tray, or electric frying pan, you can easily keep your dye bath and fiber warm throughout the dyeing process. If you cannot safely heat the dye bath in your classroom, the colors will still be taken up by the fiber, but they will simply be somewhat less intense.

4. Leave your fibers in the dye bath for an hour or more, depending on the strength of color desired.

5. Gently lift fibers from the dye bath and rinse them until the water runs clear. Squeeze out excess water, shake to remove bits of spice, and hang to dry. *Be sure to label your dyed samples!*

***You might have fun trying a very primitive technique of cloth-dyeing called “leaf whapping.” Lay a piece of pre-washed cotton fabric on a board or the pavement. Arrange one or more leaves on it, then cover with another piece of pre-washed cotton (This top piece is the fabric that will have the best print when you are finished.) Use a hammer or a rock to pound evenly all over the surface of the cloth, releasing the leaf’s juices. You will start to see the plant design coming through onto the fabric. When you’re satisfied with what you’re seeing, gently lift up the top layer of fabric and peel off the remains of the leaves. As a mordant to help your plant dye last longer, brew 3-4 teabags in a quart of water and soak the cloth in this tea solution for several hours, stirring from time to time. Rinse until water runs clear. Hang to dry.

