

Laura Garbštienė

Make a Rainbow

Lesson plan



Repository
of Knowledge

Riga
International
Biennial of
Contemporary
Art

NIDA
of Vilnius
Art Academy

helsinki
international
artistic
programme



EMPOWERING TOOLS

Lesson plan: Make a Rainbow

Subjects: Chemistry, biology

Interdisciplinary links: Botany, history, ethics, geography

Age group: Primary school, secondary school

Duration: 3–4 lessons

Learning outcomes:

- To learn about the chemistry of plants and how to extract colour pigments that can be used to make your own plant dyes
- To learn about the history of the textile dyeing industry
- To learn about the processes involved in making clothing

You will need:

Fibres (for example, an undyed cotton bedsheet)

Glass jars

A cooking stove and pot

Ashes

White vinegar

Gum arabic

Alum (aluminium potassium sulphate)

Rusty iron pieces*

Copper pieces*

**Optional*

Topic introduction:

The textile industry is one of the world's biggest polluters and dyeing is one of the industry's most harmful processes for the environment. This lesson will introduce the historic practice of making plant dyes and natural inks, as well as using natural dyes to colour fabric, all of which can be made at home or school in an improvised lab environment.

Activity plan:

The learning kit consists of three activities that will encourage students to find dye-plants and document their findings, experiment with making dye extracts, and then use the extract to dye some fibre samples. Prior to these activities, we suggest using the support materials to learn a bit about the chemistry of plants and begin a discussion about the textile industry.

Activity: Make plant dye extracts

Step 1: Source your plant material

Look for plants that are abundant in your local area. Take branches, bark, leaves and roots from fallen trees, or use green waste from flower and vegetable gardens before they are composted. Try to avoid picking rare plants or taking too much from areas where there is only a small amount of any given plant.

Step 2: Extracting dye molecules

Dye molecules are easily extracted by soaking and/or simmering plant material in water. The strained plant solution is your dye, and the dehydrated powder is the base for an ink. Some plant material, such as buckthorn berries and tree barks, can produce a variety of results when fermented for between a week and a month in an acidic or alkaline solution.

Step 3: Making a natural plant ink

To make ink you first need to create a strong dye solution. Then, pour a thin layer on to a pan and leave it to dry. Scrape up this powder and mix it with a little bit of water and powdered gum arabic. Mix in a few drops of iron water if you want to make the shade darker.

Activity: Use natural dyes to colour fabric

Step 1: Prepare your fibres—washing and mordanting

A key aspect of the dyeing process is getting the dye to stick to the fibre by simmering your chosen material in a prepared dye solution. To do this you need the help of a mordant, which acts as a bridge connecting the dye with the fibre. Most mordants are ions because the electrical charge on the ion attracts the electrical charge on the dye, enabling them to hold onto the dye molecules and ensure they don't wash away.

Step 2: Mordant your washed fibres

The most popular mordant used with natural dyes is alum, of which there are different forms both natural and manufactured. Whichever kind you choose, you will need 10 grams of alum per 100 grams of fibre. Dissolve the alum in boiling water and add to a pot of hot water. Then add your fibres, heat until simmering, and leave to steep for 24 hours. Make sure to stir the fibres from time to time and then thoroughly rinse once they've finished steeping.

Step 3: Simmer, rinse and dry

Simmer the mordanted fibres in the dye bath made from strained plant extract, making sure to only heat gently so that it doesn't start to boil. Leave the fibres to soak overnight in the dyebath, and then rinse and hang to dry. If they appear paler in colour than desired when dried, wet the fibres again and repeat the dyeing process.

You can overdye your fibre samples in another dye bath to create different shades. You can also experiment by altering a few samples of the same colours using different modifiers. Alkaline modifiers can be made with wood ash by soaking the ash in water for a week, pouring the alkaline water into another pot, heating it up, and submerging your dyed samples. This will convert the colours to 'colder' shades.

To make copper and iron modifiers, use a mixture of water and vinegar to soak copper or iron metal pieces for at least a week. Strain out the metal and then heat the liquid, before soaking your dyed samples. Copper will make your colours greener, and iron will modify them to become browner and darker.

Activity: Make your own plant dye calendar

Keep a diary or notebook of at least 12 pages, one for each month of the year. Once a month, go for a walk and write about a local dye plant that is in season. (Eg., when buckthorn berries are just about to ripen or when goldenrod is blooming.)

Use a page in your notebook or diary to write or draw the plant and the way you plan to make a dye with it. Indicate the temperature, date, time, and alkalinity of the extracting and dyeing process you choose to experiment with. Include small pieces of your dyed samples.

Discussion ideas

Relevant documentaries:

“River Blue”: <https://vimeo.com/ondemand/riverblue>

“The True Cost”: <https://www.youtube.com/watch?v=5-0zHqYGnlo>

Next steps

Students can begin to record their journey in making environmentally safe and ethical clothing. Perhaps open a discussion about some of the alternative economies relevant to making clothes, and how these systems work.

Learning kit by Laura Garbštienė
Produced during Empowering Tools residency
at Nida Art Colony of Vilnius Academy of Art
Design: Krišs Salmanis
Commission: Association "RĪGAS STARPTAUTISKĀ
BIENNĀLE"

The Erasmus+ project "RIBOCA Repository of Knowledge"
is co-financed by the European Union. The European
Commission is not responsible for the content of this
publication.



Co-funded by
European Union