Quarrybrook
EXPERIENTIAL EDUCATION CENTER

**Program Title:** **Autumn's Anthocyanins!**

**Audience:** 3rd grade students

**Program Theme:** One of the most visual coping strategies in the plant kingdom belongs to deciduous trees, in the change of their leaf color and the detachment of their leaves! Through storytelling, forest exploration, and creative arts, students will gain an understanding of what's happening in autumn in colorful New England!

**Program Goals:** Students will learn about the chemistry causing the spectacular color changes that take place before the leaves fall. Students will explore the autumn forest to learn about what deciduous and coniferous trees have to do to get ready for winter. We will then apply this knowledge through a creative project where students use paint from spices and foods containing the same natural pigments present in the leaves all around us.

**Next Generation/Common Core Connections:**

**Topic:** 3-LS4 Biological Evolution: Unity and Diversity

**Dimensions:** Cause and Effect, Systems and System Models

**Program Outline:**

Activity 1: STORIES IN THE LEAVES (15 min.) – We will open with a short story about why leaves change color in autumn. Then we'll discuss the other seasonal changes occurring around us at this time of year. Students will be asked to share any prior knowledge they have regarding seasonal adaptations in trees.

**Objective:** Students will begin thinking and talking about autumn color change in leaves.

**Intended Outcome:** Students will verbally share their ideas on why deciduous leaves change color and detach, in preparation for winter.

Teachers will be helpful in encouraging students to share their knowledge, and are welcome to make any connections to classroom learning.

Activity 2: CHANGING FOREST HIKE (30 min.) – While taking a walk through the woods, we will observe the physical differences between deciduous and coniferous trees. We will discuss how each type needs to prepare differently for the challenging conditions of winter.

**Objectives:** Students will know the difference between hardwoods (deciduous trees) and softwoods (conifers). Students will be able to name two or more ways that each type copes with winter conditions.

**Intended Outcomes:** Students will be able to identify the trees along the trail as being deciduous or coniferous, and will be able to verbally share their different strategies for winter survival.

Teachers and other adults will be helpful in encouraging students to keep identifying trees as deciduous or coniferous as we walk.

Activity 3: CHASING CHLOROPHYLL (30 min.) – Next we'll engage in a simulation activity illustrating the chemistry behind the shifting colors of autumn. Students will take on the role of the chloroplasts working to produce sugars within a leaf. Mimicking the changes in daylight and temperature, each new round of the game will represent another week closer to winter with students physically simulating what happens to the chlorophyll in the leaves before they are shed. Relevant pigment vocabulary will be reinforced throughout the game, i.e., chlorophyll (green), xanthophylls (yellow), carotenes (orange), anthocyanins (red).

**Objective:** Students will simulate the chemical changes and resulting color changes occurring in deciduous leaves as autumn progresses.

**Intended Outcomes:** Students will understand that as chlorophyll production slows down and then stops, leaves change from green to the yellow and orange colors that have also been in the leaves all summer, yet were hidden by the chlorophyll. Students will understand that the red pigments are being newly produced, as the trees prepare for winter.

Teachers are encouraged to participate in the game by being "taggers," representing the seasonal triggers for color change and leaf detachment.

Activity 4: STORY PAINTING WITH FOOD (30 min.) – We will come full circle with our lesson by blending storytelling with art and science. Students will end their hike at an "art studio" where they will imagine their own story about color change, then use watercolor paints made from spices and foods (such as paprika, turmeric, cinnamon, beets) that contain the same chemical pigments as are found in leaves. Students will be encouraged to paint images illustrating their story, on watercolor paper.

**Objectives:** Students will practice storytelling and recall relevant vocabulary from the lesson. Students will creatively paint with natural spice dyes, which contain the same pigments that are in the leaves.

**Intended Outcomes:** Students will demonstrate their understanding of the topic through their short stories by using relevant vocabulary and explaining why leaves change color. Students will paint take-home images to illustrate their stories, using the natural spice dyes.

Teachers and chaperones will be helpful in encouraging students to paint images that support their stories. All adults are welcome to create their own paintings as well!

**Conclusion/Wrap-up:** (15 min.) Students will have the opportunity to share their stories and images with the group. Together, we will connect what they have learned with what they have created.

**Successful completion of this program will help support your students' proficiency in NGSS Performance Expectations:**

3-LS2.C Ecosystem Dynamics, Functioning, and Resilience: When the environment changes in ways that

affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

3-LS4.C Adaptation: For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.