Trees: Buds and Twigs

Rationale

In those parts of the United States where deciduous trees predominate, changes in the spring are dramatic. Youth are quite aware of these spring changes, but they probably have not closely observed how the leaves emerge. To prime their interest and focus their attention of the emergence of leaves, branches from trees and bushes can be collected and placed in bottles of water. Gradually, the buds open and leaves or flowers emerge.

The goal of this activity is to have youth observe the change in the buds and the timing of their emergence, and to discuss what factors in the environment bring about the changes of the buds.

A guiding question is, **To what extent does the increasing warmth and length of daylight contribute to the emergence of leaves from buds in the spring?**

Materials

For each group of 2 or 3 youth

- 1 plastic bag (gallon size) or plastic grocery bag
- 1 container for water (such as glass jars or soda bottles; 7–8 inches tall)

For the whole group

- knife or cutting shears
- masking tape
- permanent markers
- tree/plant identification books
- chart paper
- digital cameras

Preparation

The timing of the collection of branches will depend on the part of the country where you reside. For those in northern climates, you should start collecting specimens in late February. Those in southern climates should collect specimens in January. Youth will have a bigger interest and investment in observing changes on tree branches if they do their own collecting. Before youth are taken on a field trip to look at the changes in trees, you should go and survey the trees and note which ones would be most useful to focus on and from which ones you could cut a small branch. Find trees that have branches low enough for easy cutting. Note the status of the buds on the branches. Do they look healthy or do they appear to be broken or damaged in some way? Are they starting to turn green?

Also, to add to the diversity of the collection, you could collect branches from other kinds of trees not found in the area where you will be taking the youth.

NOTE: Branches from willow trees would be particularly interesting for youth to observe. They are one of the few trees that will produce roots when their branches are placed in containers of water, so try to find some in your area.

Make a chart on chart paper on which you can record the group's observations about bud changes on the branches. This chart should be similar to the one shown below (which includes a sample item) and should be posted close to where you keep the branches in your room. During subsequent sessions, take a short time to have the whole group observe and discuss any changes in the twigs. Then, record on the chart the changes they observed.

Record of Bud Changes

	Date							
Type of tree	3/28	4/4	4/12					
maple	buds tight	bud becoming bigger	bud is expanding into 3 leaves					

Introducing the Activity

Have youth recall their own memories of watching plants change in the spring. Ask them if they have ever looked closely at where the leaves emerge on the trees and how they emerge.

Start a discussion on what factors in the environment may cause these changes. The idea is to get the youth thinking about these factors but not coming to any definite conclusion.

During the Field Trip

Divide youth into groups of two or three. Lead the groups to the trees that you have pre-selected and have them observe them closely, especially the branches. At this time, have them make drawings and take photos of one selected branch. (Remind youth when taking photos to use the macro feature on the camera to get a closer and clearer picture of parts of the branches.)

To motivate them to look closely, point out that the branch is extending itself each year. Can they find markings on the branch that would indicate each year's growth?

Source: http://kuvanto.blogspot.com/2007/04/hiding-ladybird.html. Photo courtesy Hurina.

New spring growth showing branch extension.

Also, direct their attention to the whole tree to which their selected branch belongs and encourage them to study other branches on the tree.

- Do all branches have buds?
- Where are the buds located on the branches?
- What do the buds look like?

Using a field guide, have them identify their trees. Then, in their journals, have them describe their selected trees in terms of whether they are young or old; damaged, sick, or healthy; their location; and whether they stand alone or are surrounded by other trees.

Now have groups move from tree to tree with the same questions in mind. Then, have them select some branch specimens that they will bring back to the center. Using a knife or cutting shears, they should cut off no more than 10-12 inches *from the ends of the branches*, as shown below.

Photo courtesy Bernie Zubrowski

The 10–12 inches at the end of a branch will show the most growth.

To identify their branches later, have them fold a small piece of masking tape over the branches (sticking the tape to itself to create a secure label) at the tree site with the type of tree, the location, and the date.

Immediate Observations

On return to your center, have youth place the branches in containers of water. Before placing the branches in the containers, make sure each branch is labeled.

If possible, place these bottles next to a window where they will catch some sunlight during the day. To be able to make comparisons from one session to the next, assist the youth in taking photos of each branch as well as making a drawing of each. When taking the photos, tell them to place the branch in front of a large white sheet of paper or a plain wall.

NOTE: You may want to suggest that youth carry out the following experiment: Have them place branches from the same tree in different locations, for instance, placing one next to a sunny window and another in a shady corner. Would this placement make a difference in whether and when leaves emerge?

Encourage them to look closely at the branches, making drawings of the different markings in them. Point out that the age of the branch can be determined by looking closely at the markings on the branch. Tell them that they will be keeping track of the changes in the buds over the next few weeks.

Long-Term Observations

During each of your sessions, direct the youth to spend a little time observing the branches they have placed in the containers. Have them make quick drawings in their journals as well as take photos of each of the branches, which they can print out and place in their journals. If there are major changes with some of the branches, spend some time discussing how they have changed.

NOTE: If meeting only once a week, try to make some arrangement with staff or youth at the center to take photos on other days when the group is not meeting to record quick changes in the buds and leaves.

After there has been a full emergence of leaves and flowers, have students check their notes and report on what changes have happened and how long it took.

- Did any of the leaves first emerge in colors other than green? (Some oak leaves first emerge as red in color but then change to green.)
- Did the color of the leaves change as the leaves became larger? (Some leaves start out as a pale green and gradually become a darker green.)
- Did the leaves' shape change as they became larger? (The size of the leaves increases, but in some instances, the shape also changes slightly.)
- Do some buds first produce flowers followed by leaves?

You can return to a question asked previously: What environmental factors might trigger the change in the buds?

Point out that the emergence of the leaves is a risky undertaking for the trees. In late winter or early spring, there may be some warm days when temperatures are far above freezing but then return to winter temperatures for a few more weeks. The trees have evolved ways of protecting their buds against these possibilities. Trees have a way of determining the length of day. So, if there is a warm period in February in the northeast United States, for instance, trees have mechanisms to stop their buds from opening up.

Observing Behavior

After youth have collected and set up the branches in the containers, it may be a challenge in subsequent sessions to direct their attention to the branches and to any changes happening between sessions. Some of the branches may not have any leaves emerging for weeks; therefore, it may be best to view this activity as intermittent and note how youth react when leaves do emerge.

- Do they notice the emergence of leaves?
- Do they comment on the size and shape of the leaves?
- Do they make comparisons to the other leaves that have already emerged?

It is useful to keep in mind that the branches were brought inside so that youth could have a closer look at the changes and compare the timing indoors to what happens outdoors. So, prompt the youth to discuss what environmental conditions appear to be major factors in bringing about the emergence of the leaves. Do they consider both the warming temperatures and, more importantly, the lengthening of the amount of daylight?

Background

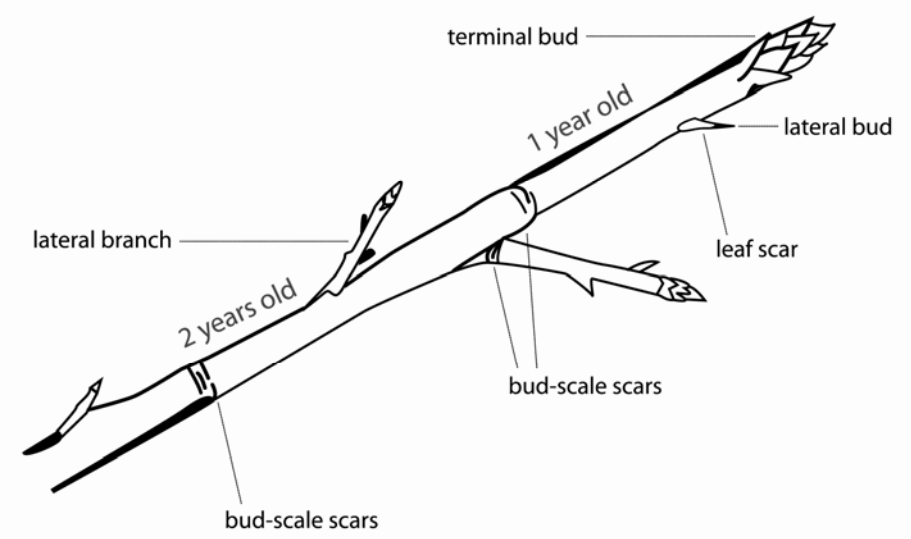
Buds

If you examine a tree bud closely by pulling away the scales and cutting into it, you may discover that miniature leaves are inside the bud. These preformed leaves are ready to emerge when there are warming temperatures and when the amount of daylight has increased. This strategy allows them to emerge and grow quickly. Not all trees have these preformed leaves. Among some that do are ash, beech, oak, hickory, walnut, horse chestnut, and many maples and conifers.

With other trees, only *some* of the leaves are preformed. The preformed leaves emerge but are followed by later leaves that are totally new. Among trees having this strategy are elm, cherry, birch, poplar, willow, apple, and conifers such as larch, juniper, and western red cedar.

Source: Thomas, P. (2000). *Trees: Their natural history*. Cambridge, UK: Cambridge University Press.

Branches of trees have various markings and scars that are indicators of growth or damage, perhaps from insects.



Bud scale scars are an indicator of growth, forming a circle around the branch

The distance between the bud scale scars indicate the amount of growth each year (see figure above). The thickening of the wood of the branch is recorded in annual rings.

For more activities like this, or for more information on how to carry out *this* activity, please go to http://treesandponds.edc.org.

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