

# Conservation Conversations

## Dichotomous Keys

### COURSE

Agriscience Foundations  
Unit: Plant Science  
Total Time: 65 minutes  
Materials: Leaf samples, whiteboard, markers, pencil, paper

### AFNR\* STANDARDS

5.0 Investigate and utilize basic scientific skills and principles in plant science. The student will be able to:

- 5.03 Categorize plants based on specific characteristics according to industry and scientific standards.

### ESSENTIAL QUESTION

How can a dichotomous key be used to categorize plant leaves for identification?

### OBJECTIVES

1. Identify differences in leaf characteristics.
2. Describe the purpose of using a dichotomous key.
3. Create a dichotomous key to categorize plant leaf characteristics.

### NOTE TO THE INSTRUCTOR

This lesson was designed specifically for trees but can be adapted to a variety of settings to teach identification.

### ACTIVATING STRATEGY

**(~5 min)** Review – Draw a flowering plant on the board. Ask students to recall, “What are the six basic parts of a plant?”

- Take 3-4 student responses. Explain the basic parts of the plant are the roots, stem, leaves, flowers, fruits, and seeds. Label each part on the example and discuss each part's function.
- **When teaching in a natural environment, you can use a real flowering plant for demonstration or draw the plant with chalk on the ground.**

Activate—Pass around multiple leaves with observable differences (size, shape, color, texture, margins, etc.). Ask students, “Do you think these leaves came from the same plant? Why, or why not?”

- Take 3-4 student responses. Then, explain that the leaves are from different plants. Clarify that observable characteristics can help classify plants into different categories to determine their type.

Context – Dichotomous keys can help us categorize specimens for identification.

**\*AFNR stands for Agriculture, Food & Natural Resources. The lesson plan content aligns with Florida AFNR pathway standards.**

## Lecture & Discussion - (~15 min)

- Morphological characteristics of leaves
  - Type
    - Simple
    - Compound
  - Arrangement
    - Opposite
    - Alternate
    - Whorled
  - Venation
    - Pinnate (net-like)
    - Palmate (net-like)
    - Parallel
  - Shape
    - Linear
    - Round
    - Oval
    - Heart
    - Egg
    - Triangular
  - Margins (Edges)
    - Entire (Smooth)
    - Serrate (Toothed)
    - Crenate (Wavy)
    - Lobed
  - Resources with visuals of leaf characteristics
    - <https://biodiversity.utexas.edu/news/entry/leaves>
    - <https://www.yorkccd.org/wp-content/uploads/2022/10/2-Leaf-Characteristics-Updated-2018.pdf>
  - When teaching in a nature setting, show students real plants with the different morphological characteristics
- Dichotomous key
  - What does the word dichotomous mean?
    - “Divided into two parts”
  - What is a dichotomous key?
    - A process of identifying an organism using a series of steps, each with two questions
    - Consist of a series of statements with two choices in each step that will lead users to the correct identification.
  - Why do we use them?
    - A dichotomous key is an important scientific tool used to identify different organisms, based on their observable traits.

- How do we use them?
  - Each step of the key will have two choices. Select the option/choice that is most true about your specimen. Continue moving along the key, following the next option that is most true for your specimen until you reach the end of the key. The final choice will be the correct identification of your specimen.
- Demonstrate how to follow a dichotomous key using a pre-existing example.
  - <https://amaritime.org/wp-content/uploads/2020/04/How-to-Use-a-Dichotomous-Key.pdf>
    - This resource is not a plant key but it explains clear steps to use a branching dichotomous key with an example.
  - [https://publicfiles.dep.state.fl.us/DEAR/DEARweb/BioAssess/Plants/Woody\\_Plants\\_Key\\_508\\_compliant.pdf](https://publicfiles.dep.state.fl.us/DEAR/DEARweb/BioAssess/Plants/Woody_Plants_Key_508_compliant.pdf)
    - This key is a Florida example for woody plants near lakes.
  - Alternative: Create your own simple dichotomous key.
- Demonstrate how to make a dichotomous key on the front board using the branching method
  - When teaching in nature, this can be drawn on the ground with chalk

## LEARNING APPROACH 2

### Key Creation - (~40 min)

- (~2 min) Before starting the activity
  - Explain that multiple characteristics of plants are used to correctly categorize and identify plants, including stems, bark, flowers, and fruit, but for this activity, we are focusing exclusively on leaves.
  - Create small groups of 3-4 students. Students will work collaboratively to generate a dichotomous key based on 5 leaves they collect around the facility.
- (~18 min) Leaf collection
  - Walk around the facility and have each group collect 5 different leaves from various trees and plants. The instructor should be able to correctly identify each plant students chose to collect leaves from to provide them with the correct common and scientific names.
    - Alternative: Provide 5 leaves for each group to use.
- (~20 min) Key creation
  - Instruct students to label their leaf specimens 1-5.
  - Instruct students to identify observable characteristics that make each leaf unique (see learning approach 1). Have them write a general list of observations that correspond with their leaf labels.
    - What distinguishes leaf 1 from all the other leaves?
    - What makes leaf 1 similar to the other leaves?
  - Students should begin making a branching dichotomous key that results in the categorization of labeled leaves 1-5.

- Explain the following tips to aid student success with the project:
  - Use only one characteristic at a time
  - Use branches with only yes/no answers
  - Start with the broadest, general statements about the leaves. Then get more specific as you continue further down the key.
- As students finish completing their dichotomous keys, the instructor can attempt to use their keys to identify one leaf randomly. Provide feedback as needed.

## RECOMMENDATIONS

- **For extending learning opportunities within the lesson**

- Provide physical examples of each morphological characteristic for students to touch and make observations (compare/contrast)
  - Have students make rubbings of each type of morphological characteristic with labels.
  - Have students draw each type of characteristic for reference.
- Discuss different types of dichotomous keys
  - Nested
  - Branching
  - Linked
- Show students examples of dichotomous keys that people use for plant identification
  - Online resources
    - [https://treespnw.forestry.oregonstate.edu/dichotomous\\_key.html](https://treespnw.forestry.oregonstate.edu/dichotomous_key.html)
      - This resource is not a Florida plant example but it demonstrates the “this or that” style of a dichotomous key. Follow couplet questions as they guide you to common trees of the Pacific Northwest based on leaf characteristics.
    - <https://gobotany.nativeplanttrust.org/dkey/>
      - This resource is a dichotomous key for plant families, genus, and species. Use an example that students are familiar with to follow the steps down to identification.
    - Ex: Easter White Oak Tree (*Quercus alba*)
  - Physical copies
    - Godfrey, R. K. 1988. Trees, Shrubs and Woody Vines of Northern Florida and Adjacent Georgia and Alabama. The University of Georgia Press, Athens. 734 p.



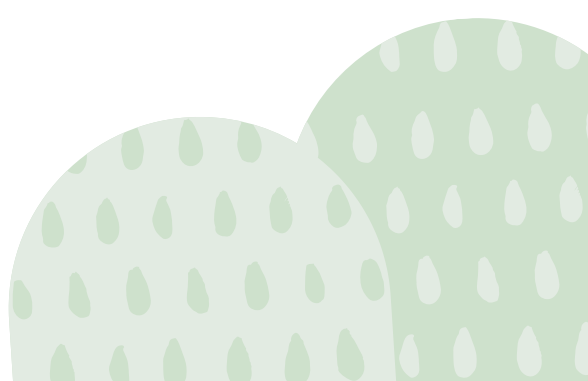
- Have students swap the keys they created with another group. Allow students to try and follow the steps the other group made. Discuss/evaluate success.
  - Did the other group's dichotomous key make sense?
  - Were you able to sort all 5 leaves correctly?
  - Did they use similar or different characteristics to sort the leaves?
  - How was the experience of creating your own key?
  - What was the first characteristic you used to categorize your leaves?

### SUMMARING STRATEGY

- **Discussion -(5 min)**
  - Discussion about utilization
    - Why is it important to have a system to categorize plants?
    - What is the importance of identifying plants?
      - Weed identification
      - Toxicity, etc.
    - Landscape assessment
      - Will this plant grow here?
      - Is this plant native?
  - Alternative: Discussion about transferability
    - What other things can dichotomous keys be used to identify?
      - Weeds, forestry, insects, animals

### RECOMMENDATIONS

- **For extending strategies for learning after the lesson**
  - Introduce major groupings of plants and their characteristics
    - Flowering (Angiosperms)
    - Conifers (Gymnosperms)
    - Ferns (Pteridophytes)
    - Mosses and liverworts (Bryophytes)
      - Practice making dichotomous keys for major groupings of plants
  - Discuss binomial nomenclature and its importance
    - Taxonomical classification was invented by Carl Linnaeus in the 1750s.
      - He created the system of naming all living things.
      - Binomial nomenclature – two name naming system
        - Genus species

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- Discuss the difference between common names and scientific names.
    - For example, common names can get confusing because people may refer to the same plant by multiple different common names.
    - Using the scientific name of an organism allows everyone to be certain we are talking about the same organism with no confusion (universally understood).
  - Landscape evaluations
    - Students can assess landscapes in specific contexts (ex: school garden, community center, neighborhood, etc.)
    - Students can present findings digitally about plant species and make recommendations to the organization
      - Are the plants Florida-friendly?
      - Are they suitable for the light, soil, and water requirements?