

**TEACHING KATE  
TEACHING KIDS ABOUT THE ENVIRONMENT  
THE NUTS AND BOLTS OF CLASSIFICATION**

**Grade Level: 6-10**

**Time Required: 6 class periods**

**SC Science Standards**

This lesson plan was correlated with only the grade level specified unless otherwise noted.

**Grade 6:**

- I. A. 1. a 1
- I. A. 1. b 2
- I. A. 1. d. 1
- I. A. 7. a

**Grade 7:**

- I. A. 1. a 1
- I. A. 1. b 2
- I. A. 1. d. 1
- I. A. 7. a
- II. A. 3. e

**Grade 8:**

- I. A. 1. a 1
- I. A. 1. b 2
- I. A. 1. d. 1
- I. A. 7. a
- II. A. 1. a

**Grade 9-12:**

- I. B. 9, 12
- II. C. 3. a, b

**Purpose**

The purpose of this lesson is to increase the students' understanding of a classification system and the use of a dichotomous key by having them classify a group of objects and use a dichotomous key to identify trees.

**Skills**

Classification, communication, comparison, contrast, cooperation, observation.

**Concepts**

All organisms can be classified or identified based on their similarities and differences. Classification is necessary for scientific study and exploration.

## Materials Needed

paper cups	poster board
pen or marker	paper
leaves or twigs for each group or individual	
copies of dichotomous key for each group or individual	
20 different pieces of hardware- all groups should have identical sets:	
nuts	bolts
screws	washers
hooks	nails
etc.	

## Definition of Terms

<u>Binomial Nomenclature</u>	A two-name system of naming organisms.
<u>Classify</u>	To put objects, ideas or organisms into groups based on similarity.
<u>Dichotomous</u>	Divided into two parts; branched or forked into two more or less equal divisions.
<u>Genus</u>	A group of similar species.
<u>Organism</u>	Any living thing.
<u>Scientific Name</u>	The two-part name of an organism consisting of the genus and species.
<u>Species</u>	A group of closely related organisms capable of mating and producing viable offspring.
<u>Trait</u>	An inherited characteristic.

## Before the Session

Collect the necessary hardware pieces, poster board and cups. For the application section of the lesson, collect the necessary tree leaves or twigs, and get copies of the dichotomous key or keys which you plan to use.

## Background Information

In science, as well as in everyday life, people attempt to organize objects, ideas or information. Placing objects, ideas or information into groups on the basis of similarity is called classification. We classify things in order to locate them more easily, see how they are similar or different, find order in the world and so we can communicate with each other by knowing we are talking about the same thing.

There are an estimated two million different types of organisms living on Earth. To find some order to this large number of organisms, scientists have developed classification systems which group these organisms on the basis of similarities. The classification system which biologists use today was developed by an eighteenth century Swedish naturalist, Carl von Linné. Linné is known by the Latin form of his name, Carolus Linnaeus. In Linnaeus' system, all organisms are grouped into five large groups called kingdoms. The five kingdoms are divided into smaller groups called phyla or, in the case of plants, divisions. Phyla or divisions are divided into classes, classes into orders, orders into families, families into genera and genera into species. The last two groups, genus and species, are used together to give each organism a two-word name called the scientific name. The scientific name is generally written in Latin or Greek. The use of a common language and an accepted name for organisms helps prevent confusion about the identity of a particular organism. Scientists all over the world can recognize an organism by its scientific name.

A classification key is a tool which organizes the traits of a particular group of organisms so that these traits may be used to identify a particular organism in the group. One type of classification device is a dichotomous key. Dichotomous keys have a series of numbered steps which take the user from very general to more specific traits. Each step consists of two statements about a single trait. Only one of these statements can be true about a single organism. The key helps the user narrow his choices until he arrives at the step which identifies the organism. Each key is specific for a group of organisms. For example, you may have a key for wildflowers in a particular region, trees in a particular region, freshwater fish, insects, etc. A key can only be used to identify organisms that are present in that key.

The process of using a dichotomous key is the same from key to key even though they identify different organisms. Begin by observing the organism in question and noting the general characteristics. Using the key, read both statements in the first step. Decide which of the two statements is true. This will lead you to another step in the key. Continue to read the statements in the steps to which your choices lead you until you arrive at the name of the organism.

## **Suggested Lesson Plan**

### Activity 1- Introduction

1. Begin with a discussion of what classification is. Discuss why we classify things and why biologists developed classification systems for organisms.
2. Discuss how students use classification in their everyday lives. (Examples: libraries, record stores, grocery stores.)
3. Define trait.
4. Discuss traits that may be used to classify various objects or information. Be sure to discuss what characteristics are required of a good trait. Good traits for classification should be unchangeable, easily recognizable, easily separated into groups, designed to gather facts, measurable and/or definitive, and free of personal bias.
5. Discuss how classification keys are usually based on paired opposites or opposing statements about a single trait.
6. Define dichotomous

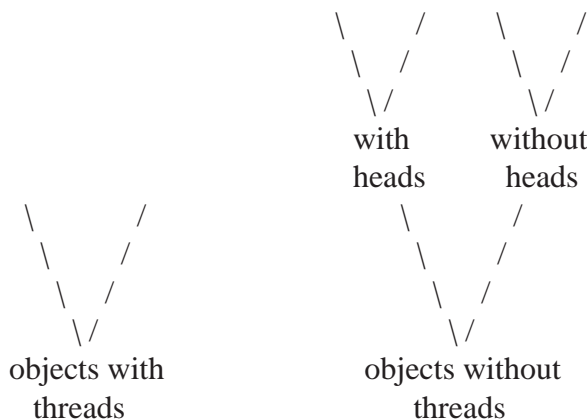
### Activity 2- Classification Game

1. Tell students they are going to play a game.
2. Decide on a trait (example: students with brown eyes). Without telling the trait, call several students with and without the trait to the front of the room. Place them in two groups.
3. Students should observe the two groups. Tell them to decide what trait makes the students in one group different from the students in the other group.
4. Repeat this several times using a different trait each time. Emphasize that they are looking for the presence or absence of a single trait. They should state the difference between the two groups by making two statements. (Example: This group of students have brown eyes. The other group do not have brown eyes.) Reinforce the term dichotomous.
5. Select a student to be the leader and have him decide on a trait and conduct the activity. Repeat this with different students as many times as desired for mastery.

Activity 3- Nuts and Bolts of Classification

1. Divide students into small groups with 2-4 students per group.
2. Give each group the necessary materials: paper cups, 20 different pieces of hardware, poster board and pen or marker.
3. Give the students the following instructions:
  - a. Remove all the hardware pieces from the cup and observe some general traits.
  - b. Divide the objects into two groups based on the presence or absence of one trait. (Example: Objects with threads and objects without threads.)
  - c. Place each object into the proper group.
  - d. Write the two statements at the bottom of the poster, one to the left side and one to the right.
  - e. Draw 2 diverging lines above each statement on the poster. (See diagram.)
  - f. Observe the objects in one group at a time. Further divide the objects based on a single trait for each group. Write the two statements above each group and place the objects in the proper group. (Example: In the group of objects without threads, students may observe that some have heads and some do not.)
  - g. Continue to divide objects in each group into two subgroups until you arrive at the level where there is only one object in each group.
  - h. At the final level, draw or trace each object next to the appropriate statement.
  - i. Place all hardware back into the cups and write the names of all the group members on the back of your posters.

Sample Diagram



**Variation:** You may use an assortment of buttons or various shapes cut from paper instead of the hardware.

### Activity 4 - Oral Reports and Class Discussion

When all of the groups have completed activity 3, have each group show its classification scheme to the class and relate the traits they used. They can then compare their system with the systems of other groups in the class. Discuss how the same objects can be classified using different traits and classification schemes.

### **Application**

Classification systems are used constantly in everyday life. In a grocery store, for example, items are classified into food or non-food items; food items into perishable or non-perishable; perishable into meats, produce, dairy or frozen; meats into chicken, beef, pork, lamb or fish; produce into fruits or vegetables; etc. When you go for a walk outside you automatically classify things you see (examples: trees, flowers, birds, insects, etc.). Classification by using a dichotomous key is a way of identifying distinct traits specific to one individual object or organism. Students should take a walk in a field or wooded area and keep a count of the number of things they see and how many of these they can not identify by name. Walk back through the area and attempt to key out some of the objects or organisms. Using keys the students can tell if a plant is edible or possibly poisonous to touch, or if an insect or snake is possibly harmful or harmless.

### **Extension**

Do *Project Learning Tree* activity number 68, "Name That Tree."

Show students examples of various dichotomous keys designed to be used for the identification of particular groups of plants or animals (see Resources Available). Have copies of *Familiar Trees of S.C.*

Bring in leaves from trees around the school or community which are included in *Familiar Trees of S.C.* You might also bring in twigs from trees and use the twig key found in *Genera of Eastern Plants*. Do the following activities instructing students how to use a dichotomous key:

### Activity 1- Large Group Guided Practice in Using a Dichotomous Key

1. Give each student the same kind of leaf.
2. Go through the key step-by-step and identify the tree. Write down the choices you make at each step of key to keep a record of your path.

**Note:** It may be necessary to review special terms related to certain leaf characteristics.

Activity 2- Small Group or Individual Practice in Using a Dichotomous Key

1. Divide the class into small groups or allow students to work individually.
2. Give each student or group a different leaf. You may give several students the same kind of leaf depending on the number of trees you have selected.
3. Give each student or group a copy of the key.
4. Have each student or group use the key to identify the tree. Remind them to begin at step one and keep a written record of their choices at each step of the key.
5. Have students bring their papers to be checked as they progress through the key.

**Note:** You can mark their papers to indicate if an error was made and at what point the error was made. Allow them to go back and correct errors until they can correctly identify the tree. Papers may be graded by deducting points for each error made during the identification process.

**Resources Available**

Familiar Trees of South Carolina. Kessler and Schoenike. (Which also lists various other tree resources such as Trees of North America, The Book of Trees and others.)

Genera of the Eastern Plants. 1975. Wade Batson. John Wiley and Sons, New York.

Heath Biology. 1989. James E. McLaren and Lissa Rotundo. D. C. Heath and Company, Lexington, Massachusetts/Toronto, Ontario.

Plant Identification Terminology: An Illustrated Glossary. 1994. James G. Harris and Melinda Woolf Harris. Spring Lake Publishing, Spring Lake, Utah.

Project Learning Tree Environmental Education Activity Guide. 1994. American Forest Foundation, Washington, D.C.

The Audubon Field Guide to North American Trees, Eastern Region. 1980. Alfred A. Knopf, New York.

Trees of the Southeastern United States. 1988. Wilbur H. Duncan and Marion B. Duncan. The University of Georgia Press, Athens and London.

Using an Identification (Dichotomous) Key to Identify Freshwater Fish of South Carolina. 1995.  
Edward P. Donovan, Jean Holland and Carol Woodward. Science Education Center, University  
of South Carolina- Spartanburg, Spartanburg, S.C.

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