

Dichotomous Keys

Objectives:

After completion of this exercise students will be able to:

- create a dichotomous key
- use a dichotomous key to classify various trees/plants

Methods:

- students will be given a package of various nuts/bolts/washers etc., and based upon these items they will create a dichotomous key to be used in the classification of these items
- students will be given a copy of a dichotomous key (see main page under Dichotomous Keys) and they will name 13 native plants and two noxious weeds using the key
- students will define and know the following terms: bunchgrass, forb, shrub, evergreen, deciduous, fascicle, petiole, pubescent, awn, blade, pinnate

Lesson Overview:

One of the most fundamental concepts of science involves classifying things by their physical characteristics. Color, shape, number of parts, height, smell, reaction to stimuli, and many other characteristics may be determined by a careful observer. The more completely an object can be described or characterized, the more likely a student is to be able to find commonalities or differences in specific specimens being compared. This ability to characterize or sort items by their characteristics is equally useful in describing plants or animals or sports cars or even good places to eat. We all do this sorting, usually subconsciously, on a day-to-day basis; only, we normally do it more informally than will be required for a scientific study.

In this lesson, students will make their own dichotomous key and will use a key that is already prepared. Several new vocabulary terms will be introduced.

Estimated Time:

One 50-minute class period.

Materials List:

Have these materials available (either one set per student or student team)

- 1 package of various size nuts, bolts, washers, etc.
- sheets from *Montana Weed Project*
- "Making A Dichotomous Key", p. [21](#), [22](#), [23](#)
- "A Dichotomous Key to 13 Native Plant and 2 Noxious Weeds" [p. 25, 26](#)
- Drawings A to O

[Drawing A](#)
[Drawing C](#)
[Drawing E](#)
[Drawing G](#)
[Drawing I](#)
[Drawing K](#)
[Drawing M](#)
[Drawing O](#)

[Drawing B](#)
[Drawing D](#)
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[Drawing N](#)

Montana Education Content Standards & Benchmarks

Science Content Standards	Elementary Benchmarks	Middle School Benchmarks	High School Benchmarks	Other Standards & Benchmarks
CS #3 "Students demonstrate knowledge of characteristics, structures and functions of living things"	BM #5 "Create and use a classification system to group a variety of plants and animals according to their similarities and differences."	BM #5 "Use a basic classification scheme to identify local plants and animals."	BM #5 "Apply classification scheme to infer and discuss the degree of species divergence using local ecosystems."	<p>Writing - CS #4 "write for a variety of purposes and audiences"</p> <p>Reading CS #1 "construct meaning as they comprehend, interpret, and respond to what they read"</p>

Teacher Notes

Lesson Introduction:

Indicate to students that the dichotomous keys are used to sort things especially by their visible characteristics. An example could be to sort buttons by color i.e., those that are white and those that are not white. Those that are not white could then be sorted by another color, such as those remaining that are brown and those that are not brown. The rule of thumb for dichotomous keys is to number choices and have an **a** or **b** selection beneath each number. At some level, each choice eventually comes to a logical end point where the final selection is made and the item is identified.

When **a** or **b** selections are available and the item is not yet identified, the key uses a “go to” statement to lead the user to another numbered choice.

Vocabulary:

Alternate – *adjective*, leaves branches and flowers are staggered on the stem, rather than being directly across from each other

Awn – *noun*, Bot. 1) bristlelike appendage of a plant, esp. on the glomes of grasses, 2) such appendages collectively, as those forming the beard of wheat, barley, etc., 3) any similar bristle

Blade – *noun*, Bot. 1) the leaf of a plant, especially of a grass or cereal, 2) the broad part of a leaf, as distinguished from the stalk or petiole

Bunchgrass – *noun*, any of various grasses in different regions of North America, growing in distinct clumps

Deciduous – *adjective*, 1) shedding the leaves annually, as certain trees and shrubs, 2) falling off or shed at a particular season, stage of growth, etc. as leaves, horns, or teeth

Dichotomous – *adjective*, dividing into two parts

Dichotomy – *noun*, a division or the process of dividing into two mutually exclusive or contradictory groups

Evergreen – *adjective*, of trees, shrubs, etc., having green leaves throughout the entire year, the leaves of the past season not being shed until after new foliage has been completely formed

Fascicle – *noun*, Bot., a close cluster, as of flowers or leaves, or bundle of needles

Forb – *noun*, any herb that is not a grass or grasslike

Glabrous – *adjective*, having a smooth surface without hairs or projections

Heads – *noun*, in flowers, a number of individual flowers growing together to appear as a single flower, such as a daisy

Lanceolate – *adjective*, a leaf that is shaped like the head of a spear or lance

Linear – *adjective*, a leaf that is very long and narrow

Margin – *noun*, the edge of a leaf

Noxious – *adjective*, harmful or injurious to health or physical well-being

Perennial – *noun*, a plant that lives two or more years

Petiole – *noun*, Bot, the slender stalk by which a leaf is attached to the stem

Pinnate – *adjective*, 1) resembling a feather, as in construction or arrangement: having parts arranged on each side of a common axis, 2) having leaflets or primary divisions arranged on each side of a common stalk

Pubescent - *noun*, 1) arriving or having arrived at puberty, 2) bot., zool., covered with down or fine short hair

Rhizome – *noun*, a creeping underground stem

Robust – *adjective*, large or stout, as in plant

Sessile – *adjective*, attached directly by the base, without a stalk

Shrub – *noun*, a low woody plant having several stems

Toothed – *adjective*, a leaf margin that is not smooth, but is indented much like the teeth of a saw

Weed – *noun*, 1) a valueless plant growing wild, especially one that grows on cultivated ground to the exclusion or injury of the desired crop, 2) any undesirable or troublesome plant, especially one that grows profusely where it is not wanted

Student Activity 1

Students will each be given a bag of nuts, bolts, washers, etc. They are to sort and organize these into piles of items that are exactly alike. They should list the names or descriptions of the similar items and develop a dichotomous key that will identify each individual item contained in the bag. Students should use descriptions of the item for the key with the name of the item only appearing as an end product, i.e., 1 inch long threaded metal shaft, ½ inch diameter, with a hexagonal 3/8 inch thick metal plate attached perpendicularly to and centered on the ½ inch shaft = ½ inch X 1 inch bolt.

Student Activity 2

Students will use a dichotomous key to name 13 native plants and two noxious weeds plus the plant drawings (pdf files of these are located under the **Materials List** above).

Student Assessment:

Activity 1: Create a dichotomous key using nuts and bolts. Graded by teacher or by class.

Activity 2: Use the *Montana Weed Project* dichotomous key. Give points for each plant successfully identified.

Extensions:

Students should gain a working knowledge of the use of descriptors for plants. At least 11 terms should be selected that students must know and be able to use.