

Lesson to Grow

Learning to Make a Dichotomous Key

Grade Level: 4-9

Essential Skills: 1, 2, 5, 9

NGSS: 4-LS1-2, 4-PS4-3, MS-LS4-2, MS-LS4-1, MS-LS4-2, HS-LS4-1

CCSS: RI.4.1, SL.4.5, W.2.7, W.2.8, SL.2.5

Time: 1 class period

Materials:

Snacks or other items that are visibly different by type, color, shape, flavors, baked, packaging, etc.;
6-8 ziplock bags per group, paper, pencils, rulers.

AITC Library Resources:

Books: *Tomatoes, Potatoes, Corn and Beans: How the Foods of the Americas Changed the World.*
Ecology Field Guide Cards/ Unit Growing Patterns
Ellie's Log: Exploring the Forest Where the Great Tree Fell

More Lessons:

Soil Horizons & Below Our Feet
Water Filtering and Soil Earth as an Apple and Soil Conservation
Bioplastics

Description:

This lesson is a fun and tasty way to introduce students to *dichotomous keys* and how to create their own keys using snack packs of nuts, dried fruit, or chips. Non-food items like pens/pencils work well, and avoid allergens.

Background:

Taxonomists are biologists who classify organisms into groups based on their structure, origin or behavior. Dichotomous keys help identify objects and organisms. These keys are tools to help identify items in the natural world such as plants, insects, mammals, reptiles, fish and even rocks. Keys are made up of a series of choices which lead the user to the correct name of an item they are trying to identify. "Dichotomous" means a key that has two parts - there are two choices in each step in the identification process. By working through the questions in a key, users eventually end up at the proper name of the object or organism they are trying to identify. A sample of a key which identifies leaves is on the second page and illustrates this process.



Make sets of things labeled with their specific type or color. If using snacks, students can eat their samples at the end of the lesson.

Directions:

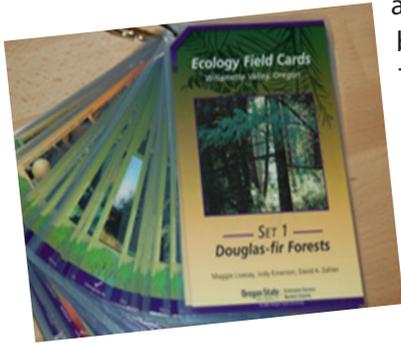
In this lesson, snacks are the objects students are trying to categorize and identify. The lesson begins with the class creating one key together, then breaking into smaller groups to make their own keys. Students then share the keys they create with the class. There can be many correct versions of a dichotomous key for the same population. For this lesson use about six to eight different types of something: variety packs of snacks or dried fruit are suggested, but you can use non-food items; a set of pens and pencils for example, or other groups of items you may have in your classroom. Place samples of each item into plastic bags, and label them with their specific brand and/or flavor/color. Make one set of items for each group. For a class of 30 you will need about six sets of items.

- 1) Begin with a brief background lecture on what a dichotomous key is, how it is used and give examples of where and why they are used.
- 2) Divide students in groups based on the amount of snacks you have, each student group should receive 6-8 bags of different snacks.
- 3) As a group, go through how to make a dichotomous key using the example on their worksheet. Place all the items in their original packaging where students can see them. For younger grades: Brainstorm with the class on how they could divide them into two distinct groups. (i.e., type, flavor, color, packaging, shape, etc.) Write the possible distinctions on the board. Next, walk students through an example. The example provided is based on packaging distinction for chips - Tube vs. Bag Packaging. For each dividing distinction, there should only be two options. Keep dividing and recording the distinctions on the board until you have classified each type of snack. For older groups: have students brainstorm within their groups to determine distinctions between snacks.

4) Have the groups share and test their keys with the class. If using snacks, let students eat and enjoy their “classified” snacks after the lesson.

Extension Activities:

This lesson can lead into students classifying other materials like plants or insects in the field. AITC has sets of *Ecology Field Cards* that can be checked out from the Lending Library. The cards



are accompanied by teacher’s guides. Topics include *Douglas-fir Forest*, *Oak Woodland*, and *Riparian Bottomland Forest*. The guides also match up with

locations in the Willamette Valley for field trips where the cards can be used to identify local flora and fauna.

Sample Key for class demonstration using a snack pack of potato chips:

The population of potato chips used:

Lays Classic	Lays BBQ
Ruffles BBQ	Ruffles Original
Pringles Original	Pringles Cheddar Cheese
Lays Stax Sour Cream and Onion	

Diagram Example:

Question: Packaging is in a tube or a bag

- 1a. Packaging is a bag
- 1b. Packaging is a tube - go to 5
- 2a. Chips have ridged surface - go to 3
- 2b. Chips have non-ridged surface - go to 4
- 3a. Chips orange color = **Ruffles BBQ**
- 3b. Chips tan color = **Ruffles Original**
- 4a. Chips non-ridged, orange color = **Lays BBQ**
- 4b. Chips non-ridged, tan color = **Lays Classic**
- 5a. Chips orange color = **Pringles Cheddar Cheese**
- 5b. Chips have other color - go to 6
- 6a. Chips solid tan with no speckles = **Pringles Original**
- 6b. Chips tan with greenish speckles = **Lays Stax Sour Cream and Onion**

Example of a dichotomous key to identify leaves:



Dichotomous Key for Leaves

1. Compound or simple leaf

- 1a) Compound leaf (leaf divided into leaflets) - go to step 2
- 1b) Simple leaf (leaf not divided into leaflets) - go to step 4

2. Arrangement of leaflets

- 2a) Palmate arrangements of leaflets (leaflets all attached at one central point) - *Aesculus* (buckeye)
- 2b) Pinnate arrangement of leaflets (leaflets attached at several points) - go to step 3

3. Leaflet shape

- 3a) Leaflets taper to pointed tips - *Carya* (pecan)
- 3b) Oval leaflets with rounded tips - *Robinia* (locust)

4. Arrangement of leaf veins

- 4a) Veins branch out from one central point - go to step 5
- 4b) Veins branch off main vein in the middle of the leaf - go to step 6

5. Overall shape of leaf

- 5a) Leaf is heart-shaped - *Cercis* (redbud)
- 5b) Leaf is star-shaped - *Liquidambar* (sweet gum)

6. Appearance of leaf edge

- 6a) Leaf has toothed (jagged edge) - *Betula* (birch)
- 6b) Leaf has untoothed (smooth edge) - *Magnolia* (magnolia)



Aprendiendo a hacer una clave dicotómica

Nombre del estudiante: _____

Los taxonomistas son biólogos que clasifican los organismos en grupos según su estructura, origen o comportamiento. Las claves dicotómicas ayudan a identificar objetos y organismos. Estas claves son herramientas para ayudar a identificar elementos en el mundo natural, como plantas, insectos, mamíferos, reptiles, peces e incluso rocas. Las claves se componen de una serie de opciones que llevan al usuario al nombre correcto de un elemento que está tratando de identificar. "Dicotómico" significa una clave que tiene dos partes: hay dos opciones en cada paso del proceso de identificación. Al trabajar las preguntas en una clave, los usuarios eventualmente terminan con el nombre apropiado del objeto u organismo que están tratando de identificar. A continuación se muestra un ejemplo de una clave que identifica las hojas e ilustra este proceso.

Ejemplo de una clave dicotómica para identificar hojas:

Clave dicotómica para hojas

1. Hoja compuesta o simple

- 1a) Hoja compuesta (hoja dividida en folletos) - vaya al paso 2
- 1b) Hoja simple (hoja no dividida en folletos) - vaya al paso 4

2. Arreglo de folletos

- 2a) Disposiciones palmeadas de folletos (folletos todos unidos en un punto central) - Aesculus (buckeye)
- 2b) Disposición pinnada de folletos (folletos adjuntos en varios puntos) - vaya al paso 3

3. Forma de folleto

- 3a) Folletos cónicos a puntas puntiagudas - Carya (nuez)
- 3b) Folletos ovalados con puntas redondeadas - Robinia (langosta)

4. Disposición de las venas de las hojas.

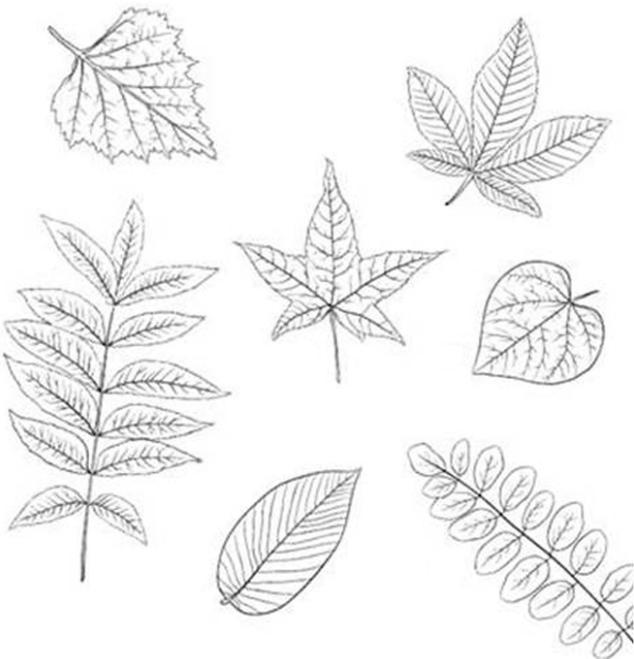
- 4a) Las venas se ramifican desde un punto central: vaya al paso 5
- 4b) Las venas se ramifican de la vena principal en el medio de la hoja - vaya al paso 6

5. Forma general de la hoja

- 5a) La hoja tiene forma de corazón - Cercis (redbud)
- 5b) La hoja tiene forma de estrella - Liquidambar (goma dulce)

6. Apariencia del borde de la hoja

- 6a) La hoja tiene dientes (borde dentado) - Betula (abedul)
- 6b) La hoja tiene dientes (borde liso) - Magnolia (magnolia)



1) Utilizando los bocadillos que le proporcionó su maestro, enumere 10 características diferentes con las que podría clasificar sus refrigerios. Piense en tipo, sabor, color, empaque y forma.

2) Cree una clave dicotómica utilizando las características definitorias enumeradas anteriormente. Use el reverso de esta hoja de trabajo para diseñar su clave dicotómica.