Plant Identification: Using Dichotomous Keys

Grade Level:
5-12

Subject Area:
Biology, Botany, Taxonomy

Time:
Preparation: 20 minutes
Activity: 45-60 minutes
Clean-up: 10 minutes

Student Performance Standards (Sunshine State Standards):
03.02 Demonstrate safe and effective use of common laboratory equipment (LA.910.1.6.1, 2, 3, 4, 5; SC.912.L.14.6SC.912.L.16.10; SC.912.L.17.12, 14, 15, 16; MA.912.A.2.1, 2)
05.02 Categorize plants based on specific characteristics according to industry and scientific standards (SC.912.E.5.4; SC.912.L.14.2, 3, 5, 6, 7, 8, 9, 53; SC.912.L15.9, 14, 15; SC.912.L.17.6, 12, 16, 17, 19; SC.912.L.18.7, 8, 9; SC.912.P.8.5, 7; MA.912.A.2.1; MA.912.S.3.2).
10.03 List examples of aquatic crops and animals (LA.910.1.6.1, 2, 3, 4, 5; SC.912.L.17.9).
11.07 Determine why aquatic crops may be more productive than terrestrial crops (LA.910.1.6.1, 2, 3, 4, 5; SC.7.L.10.2, 3; SC.7.L.11.2, SC.912.L.14.7).
11.09 Develop an information file in aquaculture species (LA.910.1.6.1, 2, 3, 4, 5)
11.10 List and describe the major factors in the growth of aquatic fauna and flora (LA.910.1.6.1, 2, 3, 4, 5; SC.7.L.17.1, 2, 3)
11.11 Identify aquaculture/mariculture species of commercial importance in your area (SC.812.L.17.16).

Objectives:

1. Students will be able to explain the importance of using correct scientific names.
2. Students will be able to use dichotomous keys to identify unknown plants.
3. Students will be able to apply identification skills to other groups of organisms.

Abstract:

Aquatic plants, including freshwater macrophytes and seaweeds, comprise a significant component of the global aquaculture market. Currently about 80% of all seaweed used commercially in the world is produced via aquaculture, primarily by

countries in the Orient for food. Seaweed cultivation in Florida is still primarily at the research stage. In contrast, Florida is a significant producer of freshwater aquatic plants, primarily for ornamental use in aquaria. These plants account for about 21% of Florida's total aquaculture production. As the global aquaculture industry expands, both freshwater and marine plant culture are likely to accelerate in Florida, especially for new, emerging uses. Identification of these plants is often challenging, but user-friendly guides are increasingly available. In this lesson, students will learn to utilize dichotomous keys to identify unknown species of freshwater or marine plants. Students will learn the importance of using correct scientific names for aquaculture and other purposes. An ancillary achievement will be for the students to become more sensitive to observing and working with plants and to increase their appreciation for their diversity and potential uses. This activity can be done with live material, preserved samples, or images of plants, and adapted for use with animals. Use of dichotomous keys is a tool that can be used in the study all of other organisms, as well as plants, so this activity has broad application for the students.

Interest Approach:

Have the students pick a body of water (fresh or salt water) near their homes or school and list the names of its plants that the students know (could be scientific or common names). Have the students briefly describe the importance of plants (ecological roles) in that body of water.

Student Materials:

1. *Overview of Marine & Freshwater Plants* handout
2. *A Dichotomous Key for Norns* exercise
3. Copies of appropriate dichotomous keys (see support materials for examples)
4. A lab note book for recording information, including notes and sketches of the specimens and the resulting identifications

Teacher Materials:

Material (per group)	*Store*	*Estimated Cost*
Samples of freshwater and marine plants Sources: 1. Live collections-require educator's collecting permit 2. Preserved samples-dried herbarium specimens are best 3. Images-readily available via the internet a. http://aquat1.ifas.ufl.edu/ -images of freshwater plants b. http://www.seaweed.ie/ -images of seaweed		

Hand lenses	Carolina Biological	$2 and up
Dissecting or compound microscopes	Carolina Biological	$80 and up
Microscope slides and cover slips	Carolina Biological	$8 and up
Glass bowls/plastic Petri dishes	WalMart/Carolina Biological	$5 and up/$20 (20 pack)
Forceps	Carolina Biological	$2 and up
Paper towels	Local grocery store	$3 and up

Student Instructions:

1. Read the handout *Overview of Marine & Freshwater Plants* for homework in preparation for this laboratory.
2. Pick a body of water (fresh or salt water) near home or school and observe if any plants are present.
3. Consider what is the importance (ecological roles) of those plants and list the names of its plants that you already know (could be scientific or common names).
4. In the lab, do the exercise *A Dichotomous Key for Norns.*
5. Briefly become acquainted with the scientific dichotomous key that will be used in the lab.
6. The teacher should take students as a group through the process of "keying out" a specimen and arriving at a tentative name. The class should read the species description for that organism to verify that it "fits".
7. Students (working in groups of 2-3) should rotate among stations (up to 10) that have different specimens, appropriate for the dichotomous key in question.
8. At each station, students should first make overall observation of the specimen, including notes and sketches of the material
9. Students should utilize the dichotomous key to identify each specimen at the stations.
10. After each tentative identification, students should read the species description for that organism to verify that it "fits".
11. When work is completed at all stations, the class should go over the answers that each team has and if there are discrepancies, discuss the reasons for the alternative identifications.

Teacher Instructions:

Preparations:

1. Obtain plant specimens (fresh or preserved).
2. Divide the class into small groups (2-3 per group if possible).

3. Prepare up to 10 stations, labeled 1-10 (each station would gave a different specimen, either in a glass bowl or plastic Petri dish if alive, a herbarium specimen if preserved, or a photo if images are used).
4. Copy the appropriate dichotomous key (1 per station or per student).
5. Copy the handout *Overview of Marine & Freshwater Plants* for each student and have them read this as homework.
6. Copy the exercise *A Dichotomous Key for Norns* for use in the lab by each student.

Activity:

1. If not already done in another class, review *Overview of Marine & Freshwater Plants*.
2. Explain why classification of organisms is important and that it involves placing them into categories.
3. Once students are in their groups, ask go over *A Dichotomous Key for Norns* as a warm-up for use of a more scientific key
4. Briefly acquaint students with the scientific dichotomous key that will be used in the lab. One alternative is to provide the students with a dichotomous key that you have prepared specifically for the specimens you have for this lab.
5. Using the key, take the whole class as a group through the process of "keying out" a specimen and arriving at a tentative name.
6. Go over the species description for that organism with the organism to verify that it "fits".
7. Assign students into groups of 2-3 to rotate among stations (up to 10) that have different specimens, appropriate for the dichotomous key in question.
8. While students are working, circulate among the stations, ask questions as to what the students are seeing, encouraging good note taking and sketching, and ask question of the students to facilitate.
9. Allow enough time at end of lab to go over the correct identifications with the class; one way to do that is to have each group of students share the path they took in the key, and, if there are discrepancies, discuss the reasons for the alternative identifications.
10. If time permits, ask students what problems they had with the keys and if they can think of any limitations to the keys they used.

Post work/Clean-up:

1. Minimal cleanup, following usual school procedures.
2. If used, glass microscope slides and cover slips should either be recycled, or rinsed with fresh water and allowed to dry.

Anticipated Results:

1. Students will identify several species of freshwater and marine plants using

dichotomous keys.
2. Students will be able to describe various parts of freshwater and marine plants.
3. Students will begin to appreciate the diversity of aquatic plant life and its importance.
4. Students will demonstrate microscopy skills (if microscopes are used).

Support Materials:

1. *Overview of Marine and Freshwater Plants* handout
2. *A Dichotomous Key for Norns* handout
3. *Use of Dichotomous Keys: Freshwater Plants* presentation
4. *Plant Aquaculture: Freshwater Plants* presentation
5. *Plant Aquaculture: Seaweeds* presentation
6. About Freshwater Plants in Florida: http://aquat1.ifas.ufl.edu/
7. About Algae: http://www.seaweed.ie/, http://www.algaebase.org
8. Introduction to a fun dichotomous key (Norns): http://www.biologycorner.com/worksheets/dichoto.html
9. Using a dichotomous key for reef organisms: *SeaWorld/Busch Gardens Coral Reefs, 4-8 Classroom Activities:* http://www.seaworld.org/just-for-teachers/lsa/i-030/pdf/4-8.pdf
10. Using dichotomous keys for jelly beans: Harry Potter and the Dichotomous Key; http://www.ansp.org/education/special_programs/senses/pdf_gwms/harrypotter.pdf
11. Creating a dichotomous key: *Education on the Halfshell: Creating a Dichotomous Key* by Cassie Zanca: http://www.lamer.lsu.edu/classroom/halfshell/pdf/dicot2all.pdf
12. Creating a dichotomous key: *How to Construct and Use a Dichotomous Key* by Stephen L. Timme: http://www.ableweb.org/volumes/vol-12/7-timme.pdf
13. Short Video: *Classify This!* http://www.glencoe.com/sec/science/biology/bio2000/biomovies/e20_1int.html

Explanation of Concepts:

Classification of organisms
Use of dichotomous keys
Relationship of structure and function

Support Materials