Unit C: Classification of Agricultural Crops

Lesson 1: Classifying and Naming Plants

Student Learning Objectives: Instruction in this lesson should result in students achieving the following objectives:

1. Explain the importance of plants.
2. Explain the taxonomic classification of plants.
3. List characteristics that determine the classification of plants.
4. Describe how plants are named.
5. Explain reasons for using the scientific names of plants.

Recommended Teaching Time: 3 hour

Recommended Resources: The following resources may be useful in teaching this lesson:

- A PowerPoint has also been developed with use of this lesson plan
- http://www.enchantedlearning.com/subjects/plants/activity/key.shtml
- http://www.spectrumanalytic.com/support/crops/croplist-sci.html
- http://watershed.csumb.edu/ron/roncor/cor/did.htm

List of Equipment, Tools, Supplies, and Facilities:

Writing surface
PowerPoint Projector
PowerPoint Slides
Specimen plant materials (potted plants, leaves, seed, etc.)

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide 2):

- Common names
- Dichotomous key
- Kingdom
- Morphology
- Plant
- Scientific names
- Species
- Taxonomy

Interest Approach: Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Bring samples of two common plants (such as maize and a native grass) into the classroom. Stems, leaves, or an entire plant will be satisfactory. Ask students to name the plants. Once name agreement has been reached, ask students to describe how the two specimens are alike and different. (They are alike because both are in the grass family and both are monocotyledons. They are different because one produces ears of maize and the other does not.) Indicate that scientists use the similarities and differences observed in specimens to classify and name plants.

Summary of Content and Teaching Strategies

Objective 1: Explain the importance of plants.

(PowerPoint Slide 3)

I. A ***plant*** is a living organism that has the capacity to make its own food through a process known as photosynthesis. As mentioned in the previous lesson, the process called photosynthesis is when plants are able to use the energy of sunlight to convert carbon dioxide and water into carbohydrates and oxygen.

(PowerPoint Slide 4)

A. Plants are found in varying climates.

1. Some 350,000 different species of plants have been identified.
2. Knowing the requirements of a particular plant helps in successfully growing it.

(PowerPoint Slide 5)

B. Plants are made of many cells.

1. Some plants, such as trees, grow quite large and live for many years.
2. Some plants are small and may live for only one year, with rice and wheat being examples.

(PowerPoint Slide 6)

C. Plants are used in many ways. Common uses of plants are as:

1. Food—Plants are used to produce human food and animal feed materials.
2. Clothing—Plant fibers are used to produce clothing.
3. Shelter—Plant materials, especially lumber and plywood, are used in building houses and other structures.

(PowerPoint Slide 7)

4. Paper—Many kinds of plants are used in manufacturing paper, with pine trees being widely used.
5. Human appeal—Some plants are used for their beauty in landscaping and preparing floral displays.
6. Others—Plants have many uses in the lives of humans, ranging from fuel sources, to medical applications, and in hobbies like gardening.

****Ask one or more students to explain what plants are and how they are used. Show specimens of materials from plants, such as lumber and**

clothing, and have students explain how these are related to plants. List the uses of plants on a board. Another approach to emphasize the importance of plants is to ask students to name the items that would be removed from their classroom if there were no plants. Their desks, tables, chairs, notebooks, and nearly everything would most likely be removed!

Objective 2: Explain the taxonomic classification of plants.

(PowerPoint Slide 8)

II. The classification of plants and other living things is known as ***taxonomy***.

A. The first efforts in taxonomy began over 2,000 years ago in Greece.

B. Modern taxonomy uses seven divisions or stages in the classification of plants, with each stage being more specific than the previous stage. These stages form a taxonomic hierarchy.

(PowerPoint Slide 9)

The seven stages in the hierarchy are listed here.

(PowerPoint Slide 10)

1. Kingdom—***Kingdom*** is the first stage, with all living organisms fitting into one of five categories under the Kingdom stage: monera, protista, fungi, and plantae, animalia.

(PowerPoint Slide 11)

Kingdom	Types of Organisms
Monera	Bacteria, blue-green algae, and spirochetes
Protista	Protozoans and algae of various types
Fungi	Funguses, molds, mushrooms, yeasts, mildews, and smuts
Plantae (plants)	Mosses, ferns, woody and non-woody flowering plants
Animalia (animals)	Sponges, worms, insects, fish, amphibians, reptiles, birds, and mammals

(PowerPoint Slide 12)

2. Division—Ten divisions are used in the plant kingdom. (This stage is also known as phylum.)

(PowerPoint Slide 13 and 14)

a. The Phylum Bryophyta (mosses, liverworts, hornworts), the most primitive of all true plants, differs from other plant Phyla in that it is non-vascular, meaning that it lacks water-conducting tissues which bring water from the roots of the plant up into the crown, and that the gametophyte

(vegetative) generation predominates over the sporophyte (reproductive) generation.

b. The Phyla Psilophyta (whisk ferns), Lycopodiophyta (club-mosses, spike-mosses, quillworts), Equisetophyta (horsetails), and Polypodiophyta (true ferns), including all vascular plants that reproduce using spores, also form an ancient, though largely artificial, grouping and are often referred to as Pteridophytes.
c. The Phyla Cycadophyta (cycads), Ginkgophyta (ginkgo), Gnetophyta (vessel-bearing gymnosperms), and Coniferophyta (conifers) form a second primitive grouping of vascular plants, known as Gymnosperms, which are characterized by the presence of naked seeds (the literal translation of "gymno-sperm").
d. The final Phylum, Magnoliophyta, contains all of the vascular, flowering plants that are considered to be the most advanced and recently-evolved plants occurring on the planet today.

(PowerPoint Slide 15)

3. Class—Members of a class have more common characteristics than those of a division
    a. As an example, the Phylum Magnoliophyta is split into 2 well-known Classes: Magnoliopsida (Dicotyledons) and Liliopsida (Monocotyledons) based on a variety of features from leaf venation and flower structure to growth form, root structure, and seed structure, each class with its subsequent Orders and Families.

(PowerPoint Slide 16)

4. Order—Members of an order are more alike than those of a class.

(PowerPoint Slide 17)

5. Family—Members of a family are more alike than those of an order. More plant species will be contained in a family than any order within it, because a family is a much more inclusive group.

(PowerPoint Slide 18)

6. Genus—Members of a genus are very similar.
    a. Representing organisms with similar morphology, structure, reproductive organs, and, perhaps most importantly, evolutionary history. These genera are designed to illustrate that the individual organisms grouped within the same genus are very closely related to each other.

(PowerPoint Slide 19)

7. Species—The ***species*** is the most specific stage in the taxonomic hierarchy for an organism. Members of a species can be bred and produce offspring similar to their parents. No two species have the same scientific name.

(PowerPoint Slide 20)

Groups within a species that have unique traits may be formed into subspecies or varieties. Species names are comprised of the genus and species.

****Call on students to give the 7 stages in Plant Classification you just went over. As they give them to you one by one write them on the board. Once all seven are given, have the students repeat these aloud as a class. Do this until they are speaking all together. Power Point Slide 21 can be used to show classification of common wheat. Walk the students through the information on this slide. This should give the students a better understanding of how the stages of classification work.**

(PowerPoint Slide 22)

C. Plant classification often involves the use of a dichotomous key.
   1. A ***dichotomous key*** is a written set of choices that leads to the name of a plant or other organism.
   2. The choices are sequential and involve determining if a plant fits a group with specific characteristics.

****Have students use a dichotomous key to classify the people in the class. Explain to them that this is an example of how a dichotomous key works, and it works on all things including people and plants. An example of how to use a dichotomous key is explained below:**

As a simple example, you can construct a dichotomous key to identify people (or another group of items) in a classroom, using questions based on gender, hair length/color, glasses (or not), clothing color, etc.

Question 1: Is the person male or female?
Question 2: Does the person wear glasses or not?
Question 3: Is the person wearing shoes or not?
etc.

The end of each branch of the key should be a person's name.

A dichotomous key will have enough questions to identify each member of the group. To test it, you can identify each person in the group by going through the key and seeing if the right name comes up.

At each step of the process of using the key, the user is given two choices; each alternative leads to another question until the item is identified.

For example, a question in a dichotomous key for trees might be something like, "Are the leaves flat or needle-like?" If the answer was

"needle-like," then the next question might be something like, "Are the needles in a bunch or are they spread along the branch?" Eventually, when enough questions have been answered, the identity of the tree is revealed.

****You could use this method with actual plants as well.**

Objective 3: List characteristics that determine the classification of plants.

(PowerPoint Slide 23)

III. Distinctions in the divisions or stages in modern scientific classification are largely based on the morphology of organisms.

A. ***Morphology*** is the study of the internal and external appearance of an organism.

1. Most plants are identified by external appearance.
2. Internal appearance of plant growth structures will help verify classification and may be needed with some species.
3. The characteristics observed are often referred to as evidence in classification.

(PowerPoint Slide 24)

B. Scientists look for similarities and differences in organisms.

1. Common characteristics with plants include leaf shape and arrangement; stem structure, including exterior bark or epidermis; root system, such as fibrous or tap; and flower color, structure, and other features.
2. Scientists may also use chromosomes, embryo growth, and biochemistry of a plant in its classification.

****Ask students to give examples of differences in plants and how these relate to classification, such as differences in leaf shapes and stem structures. Examine several plant specimens that are brought into the classroom or observed on the school grounds to determine morphological differences between species. An approach is to form students in small groups and have each group compare the different plants and prepare reports for the class on their observations.**

Objective 4: Describe how plants are named.

(PowerPoint Slide 25 and 26)

IV. Plants have common and scientific names.

A. ***Common names*** are the “everyday” names that people use.

1. Common names may vary from one region or location to another.
2. One plant species may be known by several different common names.

(PowerPoint Slide 27)

B. ***Scientific names*** are the names of plants based on taxonomy.

1. A scientific name is often comprised of two words—the genus and species of the plant.
2. Scientific names are written in italics or are underlined.
3. The first letter of the genus is capitalized; no other letters are in capital letters.
4. An example is *Triticum aestivum* —which is the common wheat

(PowerPoint Slide 28)

5. Other examples of common and scientific names are:

Rice— *Oryza sativa*
Barley— *Hordeum vulgare*
Maize— *Zea mays*
Cotton -- *Gossypium spp.*
Tomato— *Lycopersicon esculentum*
Grass pea – *Lathyrus sativus*
Almonds- *Amygdalus communis*

****Indicate that possible confusion of common names is why scientific names are used. Form students into small groups and give each group three examples of plants found locally and have them determine the scientific names of the plants. Have each group report their findings to the class.**

Objective 5: Explain reasons for using the scientific names of plants.

(PowerPoint Slide 29 and 30)

V. Scientific names enhance communication about plants.

A. Scientific names are based on relationships among different species of plants.

1. Plants with common characteristics are in the same family, order, class, and division.
2. These help scientists understand characteristics shared by different species of plants.

(PowerPoint Slide 31)

B. Scientific names illustrate differences between plants.

1. Differences should be obvious from the names of plants.
2. Maize, wheat, and barely are in the grass family, Gramineae and are obviously different from strawberries and apples in the rose family, Rosaceae.

(PowerPoint Slide 32)

C. Scientific names are universally accepted by scientists and agriculturalists.

1. Using the scientific name assures that there is no confusion about which crop is being discussed.
2. Using scientific names enhances the exchange of research information.

****Ask students to give examples of why scientific names are used. Help them to see that the common names used in local areas or regions may create confusion in communication about plants in other parts of the world. No such confusion exists when scientific names are used.**

Review/Summary: Use the objectives as the guides for reviewing and summarizing the content of the lesson. Have the students make flash cards. Give them paper that they will need to cut into 8 even squares per sheet. They will look through the material taught and write a question on one side and the answer on the other side of the square. They will then get together with a partner and "quiz" each other. One person reads the question and the other person tries to answer. When they have gone through all the cards, switch roles.

Application:. Application can involve one or more of the following activities:

—Use a dichotomous key activity

—Use small group activities to determine the scientific names of various plant species found locally.

Evaluation: Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as observation of class participation and the use of a written test. A sample test is attached.

Answers to Sample Test:

Part One: Matching

1=e, 2=i, 3=a, 4=c, 5=j, 6=g, 7=d, 8=b, 9=f, 10=h.

Part Two: Completion

1. (any two of the items listed) food, clothing, shelter, paper, and human appeal
2. morphology
3. Gramineae
4. Greece

Part Three: Discussion

The answer should include the following areas: leaf shape and arrangement, stem structure, type of root system, and flower characteristics.

Sample Test Name_____

Test

Unit C Lesson 1: Classifying and Naming Plants

Part One: Matching
Instructions. Match the term with the correct response.

a. plant	f. common name
b. taxonomy	g. scientific name
c. kingdom	h. species
d. morphology	i. Gramineae
e. dichotomous key	j. *Zea mays*

_____ 1. A written set of choices that leads to the name of a plant.
_____ 2. Family name of all grasses.
_____ 3. Living organism that makes its own food.
_____ 4. The first stage of classification with all living things in one of five groups.
_____ 5. The scientific name for maize.
_____ 6. The two-word name of a plant used by plant scientists.
_____ 7. Study of the internal and external appearance of a plant.
_____ 8. The scientific classification of plants and other organisms.
_____ 9. The name used by people without regard to scientific classification.
_____ 10. The most specific stage in scientific classification.

Part Two: Completion
Instructions. Provide the word or words to complete the following statements.

1. Two important uses of plants are for _____ and _____.

2. Distinctions in the stages of scientific classification are based on _____.

3. Maize is in the _____ family.

4. The first efforts in plant classification began 2,000 years ago in _____.

Part Three: Discussion

Instructions. Use correct spelling and complete sentences to answer the following question.

What major characteristics of plants are used in classification?