THE PLANT KINGDOM

Learning Intention:

Students will learn about the types of multi-cellular organisms that make up the kingdom of plants.

Success Criteria:

- recognize plants as belonging to one of four categories
- determine the category type of specific plants
- recognize different plant types in the neighborhood and classify according to category
- research a plant to determine its name, type, and label its parts
- dissect two plants and compare their inner structure
- conduct an experiment to understand a plant's vascular system
- identify and describe special adaptations of certain plants

Materials Needed:

- a copy of "Categorizing Plants" worksheet 1, 2, and 3 for each student
- a copy of "Plants in My Neighborhood" worksheet 4 for each student
- a copy of "Pick a Plant, Any Plant!" worksheet 5 for each student
- a copy of "Dissecting a Plant" worksheet 6 and 7 for each student
- a copy of "Stem-sational!" worksheet 8 for each student
- a copy of "Plant Adaptations" worksheet 9 and 10 for each student
- two different types of plants (moss, dandelion), an exacto knife, tweezers, a magnifying glasses (a set for each pair of students)
- a tall glass of water, a long piece of celery stalk (for each pair of students)
- spoons, food coloring
- pencils, pencil crayons, markers, chart paper, clipboards, iPods or iPads

Procedure:

***This lesson can be done as one long lesson, or be divided into six shorter lessons.**

1. Using worksheet 1, do a shared reading with the students. Along with the content, discussion of some vocabulary would be beneficial for students to understand the passage.

   Some interesting vocabulary words to focus on are:

   - reproduce
   - fertilized
   - stalk
   - consumption
   - bulb
   - dispersal
   - nutrients
   - excretion
   - spores
   - characteristics
   - vascular
   - photosynthesis

2. Give students worksheets 2 and 3. With access to the internet or local library, they will determine the category that each depicted plant belongs to.
3. Give students worksheet 4, and a clipboard and pencil. Take them out into the neighborhood to look for different kinds of plants that are growing locally. Students can record what they see by drawing pictures or making written lists. An alternate or additional option is to take along iPods or iPads to take pictures of the vegetation that they see.
4. Students will choose one plant they drew on worksheet 4 that they would like to know more about. Using worksheet 5, and with access to the internet or local library, they will provide more detail about the plant that they chose.

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5. Divide students into pairs. Give them worksheets 6 and 7, and the materials to conduct the investigation. Read through the materials needed and procedure sections to ensure students' understanding of the task. Students will dissect each plant to note differences in structure.
6. Divide students into pairs. Give them worksheet 8, and the materials to conduct the investigation. Read through the question, materials needed, and procedure sections to ensure students' understanding of the task. Students should observe and conclude that the celery stalk is similar to the vascular system in some plants because it is able to draw up water and nutrients through its stalk to its leaves, as does a rooted plant draw up the nutrients and water through its stem to its leaves.
7. Using worksheet 9, do a shared reading activity with the students. Along with the content, discussion of certain vocabulary words would be of benefit for students to fully understand the passage.

   Some interesting vocabulary words to focus on are:

   - photosynthesis
   - dormancy
   - adaptations
   - energetic
   - poisonous
   - distasteful
   - environments
   - climates
   - deciduous
   - predators
   - chemical
   - allergic reaction
8. Give students worksheet 10 to complete. They will need to visit a local library or access the internet to gather information about certain plant adaptations. A follow up option is to have students orally share information about one plant's adaptation with a classmate or within a small group.

Differentiation:

Slower learners may benefit by:

- working as a small group with teacher support to complete worksheets 2 and 3. Each student could be assigned to research one plant type. Then they could report their findings to the rest of the group. Shared information could be recorded on chart paper. A follow up option is to share this with the large group at the end of the activity.
- pairing up with a strong peer to conduct investigation and complete worksheets 6 and 7
- a reduction in expectation by only researching one or two plant adaptations to complete worksheet 10

For enrichment, faster learners could :

- research the uses and benefits of the dandelion plant to human health
- research discoveries of the Aboriginal culture on the topic of healing plants (e.g., a plant that can be used as a natural mosquito repellent)

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Categorizing Plants

There are about 300 000 species of plants on Earth. They are all unique in their own way, so to simplify their diversity, scientists categorize plants into four main groups. These groups are **mosses**, **ferns**, **conifers**, and **flowering plants**. Let's learn more about each group and the characteristics that the species in each share.

Mosses, including liverworts and hornworts, are land plants. They do not have seeds or flowers. This type of plant reproduces with spores, which are located atop each of its thin stalks, in a bulb. Mosses do not have vessels to transport water and nutrients to all its parts, so it relies on the moist environment that it lives in to provide water and nutrients.

Ferns, including horsetails, are also land plants. Ferns also reproduce with spores. If you turn a mature fern leaf over, you will see rows of tiny dots, these are spores. The spores will turn into new plants. Ferns have leaves, stems, and roots. They are considered vascular plants because they can flow water and nutrients from roots to leaves, and sugar food produced through photosynthesis, from leaves to roots.

Conifers are vascular plants that reproduce with seeds. The seeds are inside the cones on a conifer plant. The seeds contain nutrients needed for new plant growth. The cones on conifer plants produce pollen grains (male reproduction component) which are blown by the wind onto female cones to become fertilized with seeds that create new plants.

Flowering Plants are also vascular, flowing water and nutrients to and from roots to its leaves. These plants reproduce with seeds. The flower on the plant is attractive for animals that pick, carry, or eat these seeds. This aids in seed dispersal which happens in transport or through animal excretion after consumption. Wind also aids in seed dispersal.

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Do some research and classify the following plants as belonging to mosses, ferns, conifers, or flowering plants sub-categories. Justify your choices

White pine is a _____.

I know this because _____

_____

_____

_____

Marchantia is a _____.

I know this because _____

_____

_____

_____

Jasmine is a _____.

I know this because _____

_____

_____

_____

_____

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Name:

Continue to do some research and classify the following plants as belonging to mosses, ferns, conifers, or flowering plants sub-categories. Justify your choices.

Fiddleheads are _____.

I know this because _____

_____

_____

_____

_____

Cedar is a _____.

I know this because _____

_____

_____

_____

A cactus is a _____.

I know this because _____

_____

_____

_____

_____

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Plants in My Neighborhood

Have you ever noticed what kinds of plants are in your neighborhood?

Take a walk around your neighborhood. In the box below, draw and label the plants that you see.

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Pick a Plant, Any Plant!

Choose a plant that you saw in your neighborhood, and that you drew on Worksheet 4. Access the internet to help you answer these questions about this plant.

1. What is the name of this plant?

2. What type of plant is it? (circle one)

moss **conifer** **fern** **flowering plant**

Explain how you know this.

3. Is this plant an annual, a biennial, or a perennial?

4. Where does this plant typically grow?

5. Draw your plant. Label its parts.

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Dissecting a Plant

Choose two different types of plants, such as moss and a dandelion plant. It is time to go in for a closer look!

Materials Needed:

- two different types of plants
- an exacto knife
- a pair of tweezers
- a magnifying glass

What To Do:

1. Place both plants beside each other on a table, compare them. Record your comparisons below. Then draw a diagram of each plant, labeling its parts.
2. Use the exacto knife to carefully open the stem or stalk of each plant. Use the magnifying glass to observe the insides. Record your observations on worksheet 7.
3. Make a cross section cut in the root of the dandelion plant. Use the magnifying glass to observe the inside. Record your observations on worksheet 7.

Diagram of plant #1	Diagram of plant #2

Comparison notes:

_____

_____

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How are the stem and the stalk the same? How are they different?

Draw a detailed diagram of the cross section of a dandelion root.

Diagram of cross section of dandelion root:	**Observations:**

How does each plant reproduce? Explain your thinking.

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Stem-sational!

Question: What do you think will happen if you left a celery stalk in a glass of colored water?

Materials Needed:

- a tall clear glass
- along piece of celery
- access to water
- food coloring
- a spoon

What To Do:

1. Make a prediction to the question. Record it below.
2. Fill the glass with water. Add a few drops of food coloring and stir it with the spoon.
3. Place the celery stalk in the glass of colored water. Leave it for 24 hours.
4. What happened? Record your observations and a conclusion.

I predict that _____

_____

After 24 hours, what I noticed is _____

_____

To conclude, explain how the outcome of this experiment is related to the vascular system inside conifer, fern, and flowering plants.

_____

_____

_____

_____

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Plant Adaptations

Plants need water, air, warmth, light, and space to grow. With these needs met, plants also create their own food through photosynthesis. Sometimes, even with these needs met, certain plants need to have special adaptations to help them survive and grow.

Plants, like animals, need to adapt to their environments. They do this in many different ways, whether it is against the colder seasons or to defend against animals and people.

Oak, maple, and elm are examples of tree types that are deciduous.

Deciduous trees lose their leaves in the winter. Many bushes and shrubs also lose their leaves when the frost comes. These plants go into a winter sleep, called **dormancy**.

These plants may look dead in the winter, but they are not. It is just like people needing sleep to feel more energetic. Dormant plants need the coldness in order to grow again. For this reason, these plants will not grow in milder climates.

Sudan grass is poisonous only when wilted or frozen.

Plants cannot move to escape from predators, so some plants have special adaptations for survival, like poison! Their poisonous parts prevent them from being eaten by animals and insects.

Poisonous plants have created a chemical inside their roots, stem, leaves, or fruit that animals find distasteful or that will make the animal ill. Did you know that some of these plants are only poisonous at certain stages of their life cycles?

Poisonous plants are a danger to people too. These plants will make people ill if they are eaten or even touched.

Poison ivy and poison oak cause an allergic reaction that produces an itchy rash.

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Research It!

Access the internet to learn about three plants with special adaptations. Name and draw each plant. Describe how each plant uses its adaptation to survive and grow.

Special adaptation:

Special adaptation:

Special adaptation:

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