

MAPPING GRADE 4 SCIENCE INSTRUCTION

Concept: Plants
PWC Strand: Life Science

CMS Unit Test: Plant Structure and Function
Reporting Categories: Life Processes & Living Systems

PWC Objective: 4.2.1

The student will investigate and understand basic plant anatomy and reproductive processes. Key concepts include:

- general plant anatomy **(SOL 4.4a)**
- structures and processes related to reproduction **(SOL 4.4b)**
- plant classification **(SOL 4.4a-b)**

What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • What is plant anatomy? • What are the basic non-reproductive parts of a plant? • How do these processes work together to ensure a plant's survival? <p><u>Critical Attributes:</u></p> <p>4.4a <u>Plant anatomy</u> is the study of the parts of plants and their jobs. The structures of a plant are very closely related to their functions, or what they do. Non-reproductive structures include <u>roots, stems, and leaves</u>.</p> <p>4.4a The <u>roots</u> anchor the plant to the soil and absorb water and minerals from the soil. Plant <u>stems</u> provide support and allow the movement of water and nutrients. Plants make their own food in their <u>leaves</u>.</p> <p>4.4a Flowers contain parts that are responsible reproduction. Plants produce either spores or seeds. There are several basic parts of a flower. A <u>sepal</u> is one of the leaf-like parts that protects a flower bud and is usually green. The <u>petals</u> of a flower attract insects and animals that help in pollination. The <u>stamen</u> is the male part of a flower that contains <u>pollen</u>. The <u>pistil</u> is the female part of the flower.</p>	<ul style="list-style-type: none"> • Analyze a common plant: identify the roots, stems, leaves, and flowers; and explain the function of each. • Create a model/diagram illustrating the parts of a flower and explain the functions of those parts.

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What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p>The top of the pistil, the <u>stigma</u>, is sticky to collect pollen. At the bottom of the pistil is the <u>ovary</u>. When cells in the ovary are fertilized, they can develop into <u>embryos</u> and form <u>seeds</u>. Some plants do not make seeds but make <u>spores</u> instead. A <u>spore</u> is a tiny cell that can grow into a plant.</p> <p>4.4b There are many processes involved in reproduction. <u>Pollination</u> involves the transfer of pollen from the stamen to the stigma of the pistil where it grows a tube to the ovary. The sperm from the pollen grain travels to the bottom part of the ovary, and <u>fertilization</u> is complete. Some plants reproduce in other ways, such as with spores. Mosses and ferns are plants that make spores.</p> <p>4.4a-b The plant kingdom can be divided into two general groups. We classify plants by how they reproduce. Some plants produce seeds and others produce spores. Those that make seeds can be further classified as those that produce seeds from cones and those that produce seeds from flowers.</p>	<ul style="list-style-type: none">• Create a model/diagram illustrating the reproductive processes in typical flowering plants and explain the processes.• Compare and contrast different ways plants are pollinated.• Explain that ferns and mosses reproduce with spores rather than seeds.

MAPPING GRADE 4 SCIENCE INSTRUCTION

Concept: Plants
PWC Strand: Life Science

CMS Unit Test: Plant Structure and Function
Reporting Categories: Life Processes & Living Systems

PWC Objective: 4.2.2

The student will investigate and understand basic plant processes. Key concepts include:

- photosynthesis (sunlight, chlorophyll, water, carbon dioxide, oxygen, and sugar) **(SOL 4.4c)**
- dormancy **(SOL 4.4d)**

What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • What are some of the life processes plants must carry on in order to survive? • What are some responses plant shows to stimuli in their environments? • How do these processes work together to ensure a plant's survival? <p><u>Critical Attributes:</u></p> <p>4.4c Plants make their own food from water, carbon dioxide, and nutrients they take in through a process called photosynthesis. The leaf is the main site of photosynthesis. Using light from the sun, the leaves of plants trap energy in a pigment called <u>chlorophyll</u> that makes their leaves and stems green. The raw materials are changed into a sugar called <u>glucose</u> and transported throughout the plant. The plant's roots store extra glucose to use later as food. Oxygen is given off in the process of photosynthesis, and is the source of oxygen we depend on.</p> <p>4.4d <u>Dormancy</u> is a period of suspended life processes brought on by changes in the environment. Some plants lose their leaves during their dormant period; evergreens are plants that retain their leaves all year.</p>	<ul style="list-style-type: none"> • Explain the process of photosynthesis. • Design an investigation to determine the relationship between the presence of sunlight and plant growth. • Explain the role of dormancy for common plants.

MAPPING GRADE 4 SCIENCE INSTRUCTION

Concept: Virginia Ecosystems
PWC Strand: Life Science

CMS Unit Test: Virginia Ecosystems
Reporting Category: Life Processes & Living Systems

PWC Objective: 4.2.3

The student will investigate and understand how plants and animals in Virginia ecosystems interact with one another and with the non-living environment. Key concepts include:

- behavioral and structural adaptations **(SOL 4.5a)**
- organization of communities **(SOL 4.5b)**
- flow of energy in food webs **(SOL 4.5c)**
- specific habitats and niches **(SOL 4.5d)**
- plant and animal life cycles **(SOL 4.5e)**
- human influences on Virginia ecosystems **(SOL 4.5f)**

What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • What is an ecosystem? • What are behavioral and structural adaptations? • How are communities of living things organized? • What are a food web, a habitat, a niche, and life cycle? • What are some habitats in Virginia? <p><u>Critical Attributes:</u></p> <p>Communities are organized in such a way that the animals, plants, and <u>nonliving</u> resources (water, sunlight, oxygen, minerals, and soil) interact with each other.</p> <p>4.5a Organisms are adapted to the particular ecosystems they live in. <u>Adaptations</u> increase the chances for survival and success in the ecosystem. <u>Behavioral adaptations</u> include changes in what organisms do (their responses) due to changes in the environment. <u>Structural adaptations</u> involve changes in the anatomy or physical parts of an organism. <i>Behavioral</i> and structural adaptations help organisms meet life needs.</p>	<ul style="list-style-type: none"> • Distinguish between structural and behavioral adaptations. • Infer the function of basic adaptations and provide evidence for the conclusion. • Understand that adaptations allow an organism to succeed in a given environment. • Explain how different organisms use their unique adaptations to meet their needs. • Create a model of an organism adapted to a unique environment.

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What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p>4.5b The organization of communities is based on the utilization of the energy within a given ecosystem. Within a community, organisms are dependent on the survival of other organisms. The sun's energy cycles through ecosystems from producer through consumers and back into the nutrient pool through decomposers. A food web consists of all the potential feeding interactions between organisms in a community. The greatest amount of energy in a community is in the producers.</p> <p>4.5b An organism's <u>habitat</u> provides food, water, shelter, and space. The size of the <u>habitat</u> depends on the organism's needs. A <u>niche</u> is the function that an organism performs in the food web of that community. A niche also includes everything else the organism does and needs in its environment. No two types of organisms occupy the exact same niche in a community.</p> <p>4.5c During its life cycle, an organism's role in the community, or its niche, may change. For example, what an animal eats, what eats it, and other relationships will change. Ecosystems consist of communities of organisms and the interrelated <i>niches</i> within it. Ecosystems are self-sustaining. This means that all of the living components have their life needs met by the other components (<i>living</i> and <i>nonliving</i>) in the ecosystem.</p> <p>4.5d Since humans are included in the communities of many ecosystems, their activities affect them and can have either positive or negative impacts. The destruction of habitats, the places or kinds of places where plants and animals naturally live, is the main cause of endangered animals and plants in ecosystems. Air, water and land pollution, and exploitation of natural resources upset the balance of living and non-living components of an ecosystem and put them in jeopardy. Fortunately, humans can also conserve resources, use land wisely, and use appropriate waste disposal methods to protect natural habitats.</p>	<ul style="list-style-type: none"> • Describe why certain communities exist in given habitats. • Illustrate the food webs in a local area. • Compare and contrast the niches of several different organisms within the community. • Compare and contrast the differing ways an organism interacts with its surroundings at various stages of its life cycle. Specific examples include a frog and a butterfly. • Differentiate among positive and negative influences of human activity on ecosystems. <p>Teacher note: This critical attribute is linked to resource use objectives in the Environmental Science strand.</p>