EAST PENN SCHOOL DISTRICT

Botany
July 14, 2025

Botany Unit 1 - Plant Evolution

STAGE 1 | DESIRED RESULTS

Standards

3.1.9-12.B
Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

3.1.9-12.S
Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

Transfer

Students will be able to independently use their learning to...(make purpose-takeaway in 5 years)

- ❏ The diversity of plants we see today is the result of millions of years of adaptation to changing environments. Plants, and the ecosystems they live in, function as dynamic systems, and changes to one part of the system—like form, structure, or environment—affect the whole.
- ❏ Humans directly benefit from the diversity of plant life in the ecosystem services, foods, medicines, fibers, and other products they provide.

Meaning

UNDERSTANDINGS
Students will understand that...

- ☐ Plants have unique structures & behaviors that help them survive and thrive.
- ☐ Plants have adapted to a variety of habitats on land and in water.
- ☐ Comparisons between plant species provide evidence that they evolved from common ancestors, explaining their similarities and differences.
- ☐ The evolution of plants on land shaped Earth's environment & enabling animal life to thrive on land.

ESSENTIAL QUESTIONS
Students will keep considering...

- ☐ What qualities do all plants have?
- ☐ How did the present-day diversity of plants evolve over time?

Acquisition(need to align with above and standards)

Students will know...

- ☐ The four basic needs of a plant *(Light, water, nutrients, air)*
- ☐ Defining characteristics of each major plant group: non-vascular plants (algae & mosses), seedless vascular plants (ferns),

Students will be skilled at...

- ☐ Identify the defining features of a plant
- ☐ Explain how plants meet their basic needs
- ☐ Analyze phylogenetic trees to determine evolutionary relationships
- ☐ Explain how plants evolved specific structures & behaviors to transfer from water to land

	gymnosperms (conifers) & angiosperms (flowering plants) ☐ The evolution of seeds, flowers, and fruits allowed plants to reproduce more efficiently and without water, spread to new environments, and protect their offspring ☐ The evolution of vascular tissues allowed plants to grow larger and thrive on land.	☐ Explain plants' impact on early Earth (oxygen production, soil formation, habitat creation)

Botany Unit 2 - Plant Tissues

STAGE 1 | DESIRED RESULTS

Standards

3.1.9-12.W
Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

3.1.9-12.B
Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Transfer

Students will be able to independently use their learning to...(make purpose-takeaway in 5 years)

- ❏ The diversity of plants we see today is the result of millions of years of adaptation to changing environments. Plants, and the ecosystems they live in, function as dynamic systems, and changes to one part of the system—like form, structure, or environment—affect the whole.
- ❏ Humans directly benefit from the diversity of plant life in the ecosystem services, foods, medicines, fibers, and other products they provide.

Meaning

UNDERSTANDINGS

Students will understand that...

- ☐ Like all organisms, systems of specialized cells & tissues within plants help them perform the essential functions of life.
- ☐ Plants have adapted their organ structures and tissue types to thrive in various biomes.
- ☐ Common vegetables that we eat come from different parts of plants

ESSENTIAL QUESTIONS

Students will keep considering...

- ☐ How are the internal systems of plants organized?
- ☐ Why are plants so different from one another?
- ☐ What part of a plant am I eating?

Acquisition(need to align with above and standards)

Students will know...

- ☐ The structures & functions of the three main organs of vascular plants (roots, stems, leaves)
- ☐ The structure & functions of three main tissues of vascular plants (dermal, ground, vascular)
- ☐ Common food examples of different plant tissues (roots, stems, leaves, flowers, seeds)
- ☐ Differences between monocot and dicots' roots, stems, & leaves
- ☐ Different types of root systems (taproots vs fibrous)
- ☐ The anatomy & formation of wood and bark

Students will be skilled at...

- ☐ Identify plant tissues under a microscope
- ☐ Draw & label accurate scientific drawings of plant tissues under a microscope-
- ☐ Explain how plants in various biomes (including our local biome) have adapted organs/tissues to thrive in different environments

Botany Unit 3 - Plant Reproduction

STAGE 1 | DESIRED RESULTS

<table>
<tr><th>Standards</th><th colspan="2">Transfer</th></tr>
<tr><td rowspan="6"><u>3.1.9-12.W</u>
Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

<u>3.1.9-12.D</u>
Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.</td><td colspan="2">Students will be able to independently use their learning to...(make purpose-takeaway in 5 years)
❑ The diversity of plants we see today is the result of millions of years of adaptation to changing environments. Plants, and the ecosystems they live in, function as dynamic systems, and changes to one part of the system—like form, structure, or environment—affect the whole.
❑ Humans directly benefit from the diversity of plant life in the ecosystem services, foods, medicines, fibers, and other products they provide.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>UNDERSTANDINGS
Students will understand that...
☐ Plants have evolved different methods of reproduction, such as pollination, seed dispersal, and vegetative propagation.
☐ The diversity of fruits, flowers, and seeds among plants reflects adaptations to specific environmental conditions and reproductive strategies to facilitate survival & reproductive success.
☐ Humans use fruits for food and nutrition, seeds for planting and cooking, and flowers for decoration, medicine, and perfumes, highlighting the diverse ways plants enhance our daily lives.</td><td>ESSENTIAL QUESTIONS
Students will keep considering...
☐ How do plants reproduce?
☐ Why do plants produce different types of fruits, flowers, & seeds?
☐ How do humans benefit from different fruits, seeds, & flowers?</td></tr>
<tr><th colspan="2">Acquisition(need to align with above and standards)</th></tr>
<tr><td>Students will know...
☐ How unique features of flowers attract pollinators and facilitate plant reproduction.
☐ Examples of how specific fruits, flowers, and seeds have adapted to particular environments and ecological niches, enhancing survival and reproduction.
☐ Different uses of seeds, including their role in agriculture (e.g., crop seeds), culinary uses</td><td>Students will be skilled at...
☐ Explain various sexual & asexual reproductive methods (pollination, seed dispersal, vegetative propagations).
☐ Classify different types of botanical fruits.
☐ Identify parts of flowers (e.g., petals, sepals, stamens, carpels)
☐ Identify parts of a seed (e.g. seed coats, cotyledons and embryos)</td></tr>
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	(e.g., spices, oils), and nutritional benefits (e.g., nuts, grains). ☐ Different uses of flowers (e.g. their role in perfumery, foods, & medicine ☐ Stages of a plant's life cycle, from seed germination to maturity, including the formation of flowers, fruits, and seeds.	☐ Explain the importance of the mutualistic co-evolution between plants & their pollinators

Botany Unit 4 - Plants and People

STAGE 1 | DESIRED RESULTS

Standards	Transfer
3.1.9-12.N Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. **3.4.9-12.A** Analyze and interpret how issues, trends, technologies, and policies impact agricultural, food, and environmental systems and resources.	*Students will be able to independently use their learning to...(make purpose-takeaway in 5 years)* ☐ Humans directly benefit from the diversity of plant life in the ecosystem services, foods, medicines, fibers, and other products they provide.

Meaning

UNDERSTANDINGS *Students will understand that...*	ESSENTIAL QUESTIONS *Students will keep considering...*
☐ Plants provide essential resources such as ecosystem services, food, medicine, clothing (e.g., cotton, linen), materials (e.g., wood, paper), and other products that humans rely on in daily life. ☐ Human reliance on healthy ecosystems depends on preserving plant biodiversity, which provides stability and resilience to the environment. ☐ Recognizing native species and their roles in local ecosystems is key to understanding the ecological balance and the importance of plant conservation. ☐ Human activities impact plant biodiversity, but conservation efforts can protect endangered species and sustain ecosystems for future generations.	☐ How are plants important to my everyday life? ☐ How can I identify local plants (native, invasive, and houseplants)?

Acquisition(need to align with above and standards)

Students will know...	*Students will be skilled at...*
	☐ Using dichotomous keys and/or field guides to identify local plant species

	☐ Examples of ecosystem services (e.g. climate regulation, soil health, etc.) provided by plants ☐ Different ways humans rely on plants for food, medicine, materials & other products ☐ The impacts invasive plant species have on native species ☐ How plants change through the seasons and how these changes can aid in identification (e.g., flowering times, leaf color). ☐ The ways human activities (e.g., urbanization, agriculture, deforestation) affect local plant diversity and what actions can be taken to preserve it (e.g., conservation efforts, native plant gardening, sustainable practices).	☐ Basic plant taxonomy and classification methods (e.g. leaf shapes, flower structures, seeds types, root systems, etc.) ☐ Identifying the role plants in maintaining Earth's biodiversity and the action they can take to help preserve it