



UBC
Botanical
Garden

Educational
Resource
For Teachers

Exploring Plant Diversity: Comparing Land Flora

2024

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RESOURCE OVERVIEW

Lesson Plan

Grade 11 Life Sciences

Angela Kanda

May 31, 2024

Exploring Plant Diversity

Comparing Land Flora

Overview

This lesson, when paired with the accompanying garden visit and project idea, are meant to provide a hands on, engaging experience for students to deepen their understanding of plant biology. It addresses SDG 15 – Life on Land.

In the classroom, students will learn about 4 major groups of land plants. They will have an opportunity to see plants in person during a tour at the UBC Botanical Garden, and synthesize their knowledge through a plant biology project.

Core Competencies

Thinking

Students will apply critical thinking skills to acquire and interpret information given to them in class, at the garden, and throughout their personal researching process on the project. They will also apply these skills when deciding how to best communicate their ideas on the project.

Communicating

Students will apply communication skills to engage with their peers during the classroom lesson and while at the garden. They will also apply communication skills after acquiring and synthesizing their information to present their learnings in the form of a project.

Curricular Competencies

Students will be able to:

1. Demonstrate a sustained intellectual curiosity about a scientific topic of personal, local, or global interest
2. Express and reflect on a variety of experiences, perspectives, and worldviews through place

Big Ideas

Organisms are grouped based on common characteristics.

Content

Students will understand:

1. Levels of organization
2. Sexual and asexual reproduction
3. Energy transformations in cells
4. Trends in complexity

Objectives

By the end of this lesson and project, students will have a new understanding of the various groups of land plants. They will be able to list and compare the 4 groups. Through their personal research of their representative species, students will understand characteristics that define plants into their respective group.

Students will be able to elaborate on the two stages involved in alternation of generations and distinguish the variation in these two stages across different plants species and groups.

Students will also be able to identify vascular and non-vascular plant systems and provide a comparison of the two.

Cross-curricular + Trans-disciplinary Connections and Critical Questions

1. **Environmental Sciences 11:** Students will consider how abiotic factors, such as atmospheric conditions, require plants to evolve different adaptations. They will also look at ecosystem complexities through researching the roles and relationships their plant species play, such as supporting biodiversity.
2. **Composition 11:** Students will use various reading strategies to comprehend a variety of sources and engage with the writing process to enhance the clarity of their expression.

Equity and Diversity

To ensure equity and diversity in the use of this resource, aim to provide information in multiple formats (and

First Peoples' Principles of Learning

Learning is holistic, reflexive, reflective, experiential, and relational (focused on



languages, if needed) to accommodate diverse learning needs. Modify activities as needed to best suit the needs of

individual students.

Include specimens from various global regions to ensure a representation of different ecosystems.

connectedness, on reciprocal relationships, and a sense of place).

LESSON PLAN**Lesson Plan****Grade 11 Life Sciences**

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May 31, 2024

**Exploring Plant Diversity
Comparing Land Flora****Materials:**

- Plant specimens
- Celery
- Red food dye
- Hand lens
- Water
- Knife or razor blade

Duration:

Lesson – One 80-minute period
Garden Visit – Two hours
Post Visit Project – Two 80-minute periods

Resources:

- Beaty Biodiversity Museum online database:
<https://beatymuseum.ubc.ca/research-2/collections/herbarium/herbarium-vascular-plants/>
- Amoeba Sisters video to consolidate lesson:
https://youtu.be/A_DF246uVIU?si=g3RrSoB-tBfxjwd1
- BC Species & Ecosystems Explorer: <https://a100.gov.bc.ca/pub/eswp/>

Introduction + Minds On

At the beginning of class, introduce students to various plant specimens. Ensure there is a mix of bryophytes, pteridophytes, gymnosperms, and angiosperms. Have students work in small groups to try to categorize plants and share out as class.

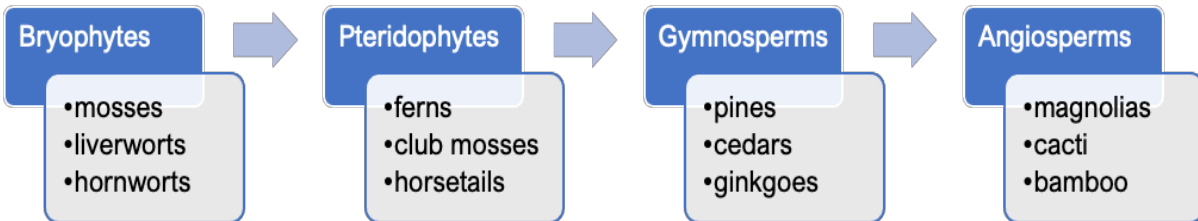
If you do not have access to fresh or preserved plant species in your classroom, consider printing out herbarium samples from an online source. The Beaty Biodiversity Museum has an online database of plant specimens that can be used for this purpose.

Alternative:

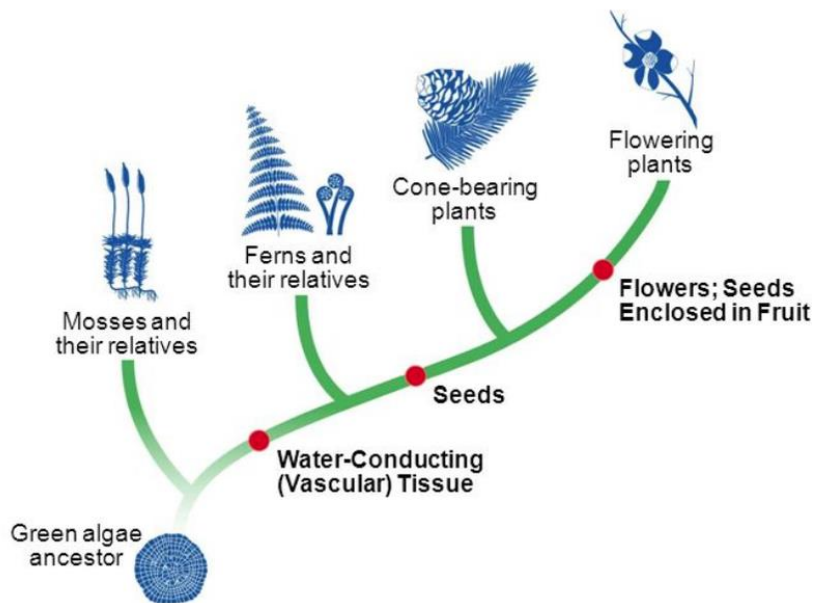
Students can be introduced to herbariums using the database for this lesson, and as a class, create their own herbarium at a later time as an extension to this activity.

Lesson

Proceed with lesson on characteristics of the four groups of land plants. A suggested lesson sequence is provided below.

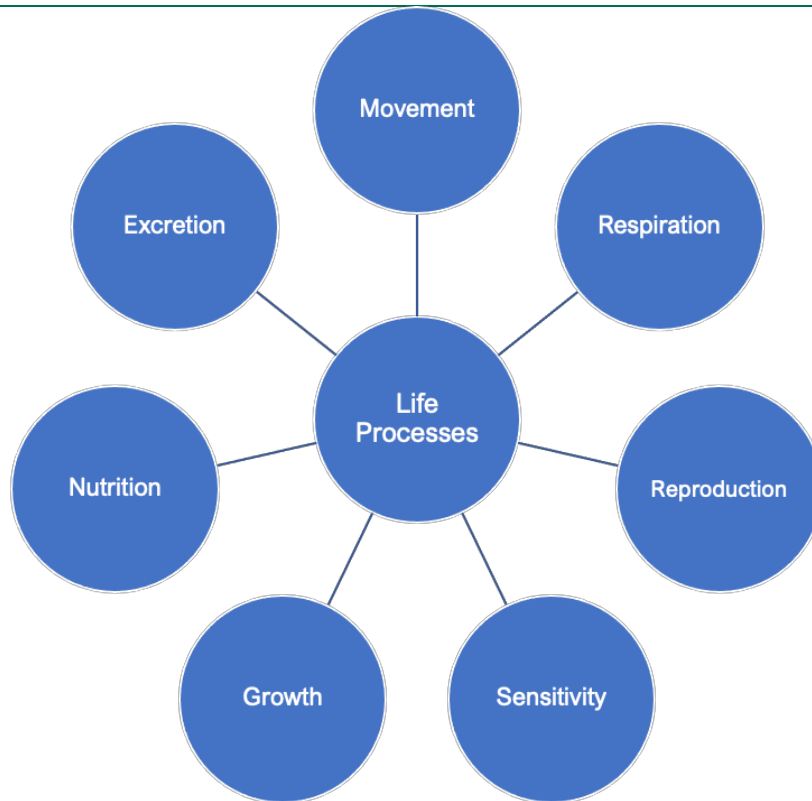


By using a cladogram/phylogenetic tree (example below) as a visual aid, explain that the groups represent different stages of plant evolution. Students may wish to think about plant evolution in terms of a timeline. Bryophytes were the first to evolve, and angiosperms are the most recently evolved.



From Prentice Hall Biology, 2004.

For each plant group, the content taught can be of your choosing but should include the seven basic life processes at a minimum.



Provide a comparison of the groups by pointing out similarities and differences in the life processes for the different groups.

For example, all land plants undergo a type of life cycle called alternation of generations. Discuss this life cycle for the four groups, including differences in this process for each.

Classroom Activity:

For a visual demonstration of uptake in vascular tissue, use celery and red coloured food dye. Cut a two-inch stalk of celery and place it into a cup of water with red food dye. After 20-30 minutes, dye will have travelled through the vascular bundles of the celery. Cut thin slices horizontally, a few millimeters wide, for students to observe using a hand lens. You may consider doing this at the start of class so celery can be ready to be cut and observed for the relevant part of the lesson.

Play [Amoeba Sisters](#) video (*Plants: Diversity, Structure & Adaptations*) to recap information for students.

Variations in Content Presentation:

The content in this lesson can also be split into multiple class periods if you prefer to talk about each group in depth. Alternatively, students may benefit from a lesson prior to this class introducing plants on a more general scale (looking at what a plant is, the

significance of all plants, and how evolution resulted in plant formation).

Garden Visit:

Ask for a tour with a focus on incorporating different plant species. As students visit various parts of the garden, they will observe plant species that fit into the groups they learned about in class. By the end of the tour, students should be able to identify at least one species for each of the four groups of plants. Students will be researching these four species (of their choosing) for a plant biology project, to be done after the garden visit. Ensure students record the names of these species to refer to later.

Additionally, have students complete a personal reflection on their visit to the garden. This can be more structured (by providing students with specific questions to answer) or more open ended. Students may include sketches of their observed plants in this.

Alternative:

Visit a local nearby park or a school garden to find different plant species. Or, visit the [BC Species & Ecosystems Explorer](#) website to find alternative species to research.

Debrief + Consolidation

When back in the classroom, discuss the experience in the garden and collect reflections. Assign students their plant biology project. A suggested idea is provided below.

Have students investigate the following aspects for each of their four representative species.

Scientific and common name	Adaptations to environment	Physical characteristics	Reproduction cycle
Interactions with other organisms	Ecological role	Growth patterns	Connections to Indigenous communities

Students will compile this information into a format of their choosing such as onto a poster board. To expand this project, consider incorporating a presentation component where students present to peers or setting up a gallery walk for the class.
