Science Unit: ***Plants***

Lesson 9: ***Land Plants and Algae***

School year:	2008/2009
Developed for:	David Lloyd George Elementary School, Vancouver School District
Developed by:	Catriona Gordon (scientist), Annie Lee, Barbara Hinson and Amber Burma (teachers)
Grade level:	Presented to grades 1 and 3, Appropriate for grades 1 – 6 with age appropriate modifications
Duration of lesson:	1 hour and 20 minutes

Notes: This is lesson 1 of a science unit comprised of 6 lessons on Plant and Animal Needs and Adaptations. All 6 lesson plans in this unit are listed below and are available from the Scientist in Residence Program website: **http://www.scientistinresidence.ca**.

1. Land Plants and Algae: This lesson.

2. Plant Lifecycles: go to the web site above, view the Plants science unit, Lesson 10 *Plant Lifecycles*.

3. Parts of a Flower and Pollination: go to the web site above, view the Soils, Plants and First Nations science unit, Lesson 3 *Parts of a Flower.*

4. What do Snails Eat?: go to the web site above, view the Forest Ecosystem science unit, Lesson 3 *What do snails eat?*

5. Marine Field Trip to Whytecliff Park: go to the web site above, view the Aquatic Ecosystems science unit, Lesson 3 *Marine Field Trip to Whytecliff Park*.

6. Tree Top Canopy Field Trip: go to the web site above, view the Temperate Forest science unit, Lesson 17 *Tree Top Canopy Field Trip*.

Objectives

1. Learn about the similarities and differences between algae and land plants.
2. Discover what land plants and algae need to grow.
3. Learn about experimental design.

Background Information

Land plants are living organisms which belong to the plant kingdom. There are estimated to be about 350,000 species of plants, worldwide. Most of these are seed plants, but they also include ferns and mosses. Algae, both marine and freshwater, are living organisms which also use sunlight to photosynthesize and can be one-celled or multicellular, such as seaweed. There are estimated to be over 300 000 species of algae worldwide. The first land plants on earth evolved from freshwater algae about 400 million years ago. Green algae are considered to be part of the plant kingdom. However, other algae, such as brown and red algae are now considered to be part of the protist kingdom. Both plants and algae make their own food through photosynthesis. They use light energy, carbon dioxide, water and chlorophyll (green pigment found in chloroplasts in leaves or cells) to make sugars. In this process oxygen is released into the environment.

Note: For the purposes of this lesson and the young ages of students we will be loosely calling algae water "plants".

Vocabulary

Algae:	Simple plant-like living organisms that can make their own food from sunlight through photosynthesis. They are usually found in water or very damp places and can be unicellular or multicellular. They include seaweeds and phytoplankton.
Seaweed:	Large multicellular algae found in oceans.
Kelp:	A long seaweed which may form forests and can grow up to 80 meters long.
Volvox:	A very well known fresh water green algae that form spherical colonies.
Photosynthesis	The process used by plants and algae to make food from sunlight. Using chlorophyll (green pigment), sunlight, carbon dioxide and water plants and algae produce sugar and oxygen.

Materials

- 3 week old bean plants (24) started at home* (plant extras just in case)
- Algal stock (volvox, or chlamydomonas) (obtained from UBC algal collections**)
- Assortment of plants/plant products including sushi, kelp chips, seaweed, paper, book, wood, rice, pencil, potted plant, apple etc.
- Nutrient solution (obtained from UBC algal collections)
- Test tubes (24)
- Test tube racks (2)
- Pipettes
- Measuring cups with millimeter markings
- Magnifying glasses
- Rulers
- Masking tape for labelling
- Indelible pens

*bean plants were started at home in 4" plastic pots using standard potting soil 3 weeks before the experiment.

algal samples were obtained from UBC algal collections **http://www.botany.ubc.ca/cccm/index.html

Introductory Discussion

1. What is a plant? What makes a plant different from an animal or us? (green, makes its own food, can't move, has leaves, roots, stems) What are some similarities between plants and animals? (both living things, both can reproduce, both live on earth, etc).
2. Why are plants important? (we eat them, animals eat them, give oxygen, provide shelter for us and for animals, provide wood, paper, fibre, clothing, medicine etc.). Look around the classroom for objects made from plants.
3. Where do we find plants? Using a globe, find Vancouver? What does all the blue on the globe mean? Are there any plants that live in water?
4. Play a sorting game. Have an assortment of items that are plants, algae, or plant products such as: sushi, kelp chips, lettuce, seeds, pencil, apple, carrots, paper or book, seaweed, (especially kelp) potted plant, rice. Get a student as a volunteer to reach into the bag and

pull out one item at a time. Try and get the other students to sort the items into two groups: land plants or water plants.

5. What do plants need? Brainstorm with students and make a chart with land plants, water plants and needs. Make a prediction with the students about what both groups of "plants" will need to grow. Eg. light, air (carbon dioxide), water, food (nutrients), space.

Science Activity/Experiment

Students will set up experiments to test the following treatments:

1. light and shade treatments on growth of bean plants and algae (Volvox)
2. moist and dry treatments on growth of bean plants
3. nutrients (food) and no-nutrients (no food) treatments on algae (Volvox)

Each table will get 2 bean plants and 2 test tubes of algae. Half the class will conduct the light/shade experiment and the other half will conduct the moist/dry (beans) and the nutrients/no nutrients (algae). Beans and algae can be placed next to a window for light conditions and far from the window for shade conditions, in a closet or under a box. Beans can be watered once every 4 days for moist conditions and not at all for dry conditions. Brainstorm about the quantity of water that should be applied to plants and agree on a specified volume with students.

For algae experiments with young students, teachers should set up test tubes prior to the lesson. Using the algal stock solution pipette an equal amount of algal solution into each test tube. For the nutrient experiment, add an equal amount of fresh nutrient solution every 4 days for nutrient treatment, and equal amounts of standing water (let tap water stand 24 hrs before using) to the "no-nutrient" treatment. For the light shade experiment, place "light" treatment test tubes near a window and "dark treatment" test tubes in the same place as dark treatment bean plants.

This experiment will be conducted over a 5-6 week period. Weekly observations and measurements can be made by the students and teacher. Height measurements will be made by rulers for the bean plants and also observations will be made as to what the plants look like, how many leaves they have, what colour the leaves are etc. Number of algal colonies will be counted and visual observations will be made on the algae as to how dark green the colonies are, etc. It is helpful to use a sheet of white paper behind test tubes when assessing darkness of colour.

Closure Discussion

1. What surprised you about the experiment. Were your predictions correct? Which bean plants/algae looked healthiest? Which looked least healthy?
2. Review plants needs, including algal needs.

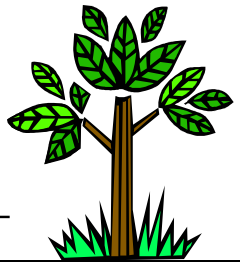
Note: Some students get very attached to their plants and if they are in a treatment which harms the growth of the plant young students can become very upset. It is important to grow a "healthy" set of beans for each student to take home at the end of the experiment, and to not attach a student's name to any of the bean plants in the experiment.

References:

Axelrood, Paige, 2005. Plants, Lesson 5 Plant Growth - Light and Shade; available from the Scientist in Residence Program website: http://www.scientistinresidence.ca.

Campbell, Neil A. Biology. 3rd Edition. Benjamin Publishing Co. 1993. Redwood City.

What do Plants Need?



Scientist:_____

I See:	
Day_____ LIGHT	SHADE O
I predict:	

_____

_____

_____

_____

Day_____ LIGHT 	SHADE O
Day_____ LIGHT 	SHADE O

I learned:

What do Plants Need?

Scientist:_____

I See:	
WET **Day_____**	DRY

I predict:

_____

_____

_____

_____

WET **Day_____**	DRY
WET **Day_____**	DRY

I learned: