Seed Germination

Nº. 93

PRIMARY/JUNIOR

Science

LESSON SUMMARY

Students will explore seed germination and the needs of trees through a series of experiments.

FORESTS ONTARIO

Focus on Forests

Oak Ridges Moraine Foundation

Activity Information

Grade: Primary/Junior

Estimated Duration: 30 to 45 minutes preparation for each activity, 2-4 week germination

Materials: Activity 1: Containers with lids, seeds, masking tape;

Activity 2 & 3: Clear containers with and without lids, paper towels, cotton batting or sawdust, seeds, water, potting soil, graph paper

Setting: Indoors

Key Vocabulary: Seeds, seed coat, pressure, germination, absorption, quantity, indirect light, artificial light, growth, liquid

Learning Goals:

- Students will become familiar with tree growth requirements (i.e. sun, water);
- Students will become familiar with the process of germination and the concept of light tolerance.

Curriculum Connections:

Grade 1

UNDERSTANDING LIFE SYSTEMS NEEDS AND CHARACTERISTICS OF LIVING THINGS

2.2 investigate and compare the basic needs of humans and other living things, including the need for air, water, food, warmth, and space, using a variety of methods and resources *(e.g., prior knowledge, personal experience, discussion, books, videos/DVDs, CD-ROMs).*

Grade 3

Science: UNDERSTANDING LIFE SYSTEMS GROWTH AND CHANGES IN PLANTS

2.3 germinate seeds and record similarities and differences as seedlings develop (e.g., plant quick-growing seeds – nasturtium, morning glory, sunflower, tomato, beet, or radish seeds – in peat pellets to observe growth)

2.4 investigate ways in which a variety of plants adapt and/or react to their environment, including changes in their environment, using a variety of methods (e.g., read a variety of non-fiction texts; interview plant experts; view DVDs or CD-ROMs)

3.1 describe the basic needs of plants, including air, water, light, warmth, and space

3.3 describe the changes that different plants undergo in their life cycles *(e.g., some plants grow from bulbs to flowers, and when the flowers die off the bulb produces little bulbs that will bloom the next year; some plants grow from germination of a seed to the production of a fruit containing seeds that are then scattered by humans, animals, or the wind so that new plants can grow).*

Teacher Background

A tree starts its life as a tiny seed. Water, warmth and time combine to start the growth process, this is called germination. When a seed starts to grow it takes in moisture, which makes it swell and split the seed coat. Once the seed begins to expand it has enough force to work its way through the soil toward the light. First a tiny root grows and bends downward into the soil under the influence of gravity. Next, the stem and leaves emerge from the seed coat and push their way through the soil toward the sunlight. The seedling then begins to manufacture its own food. Eventually, it grows into a larger tree called a sapling. Each year the tree adds a new layer of wood and bark and the trunk and branches grow thicker. Once the root has reached maturity, it produces a seed for the next generation of the forest.

Tree Growth Requirements

The rate of photosynthesis and hence tree growth is affected by the quality, intensity and duration of light. A tree's need for light varies depending on the species. Some trees, such as jack pine require full sunlight in order to grow. Others, such as sugar maple will tolerate partial shade. In general trees can be classified into two main groups: the intolerants (requiring full sunlight) and the tolerant (which do not require full sunlight).

Water forms 80 to 90 percent of a tree's bulk. Water is essential for transporting minerals and nutrients from the roots to the leaves. It is also an important raw material used in photosynthesis. Different trees have different water requirements, much like light. Ceders can be a very water demanding species, whereas red oak can grow comfortably in drier areas.

Nutrients are important for growth. Nutrients come from the soil medium in which plants grow, therefore soil quality can affect how a tree grows. For more information about the value of soils for tree growth check out the Focus on Forest lesson plan Forest Soils at www.focusonforests.ca.

Activity #1

Step 1 Fill a container with any type of seed. Add enough water to cover the seeds and then seal the lid with masking tape.

Step 2 Discuss the process of germination with your students. Ask them to predict what will happen to the seeds and the container and write down their predictions.

Step 2 Set the container aside and observe daily. Eventually the absorption of the water and the internal pressures in the germinating seeds will create sufficient pressure to crack the plastic container. Compare students predictions with that actually occurred.

Extensions

Take a spring hike through the neighborhood looking for signs of germinating seeds. In an urban environment look for unusual examples of the power of germinating seeds (e.g. plants that have pushed through the asphalt or cracks in concert).

Activity #2

Ask your students: do plants need light to grow? What would happen to green plants if they did not have sunlight? Challenge students to create their own experiments to help find the answers, or have them try the following experiment as a model:

Step 1 Plant four or five lima bean seeds in potting soil approximately 2.5 cm from the bottom in three containers. Add enough water to soak the soil. The seeds should germinate within a week or so.

Step 2 After the seeds have germinated, let the class decide what type and amount of light each plant will receive (e.g. direct sunlight, indirect sunlight, artificial light, no light). Keep all other variables consistent (e.g. water, temperature).

Step 3 Label each container (date planted, type of light), place them in their chosen location and add water when needed. Use a bar graph to record results.

Step 4 Observe each plant daily with your class and record observations.

Step 5 After three weeks, discuss which plants grew best, did this have anything to do with the light conditions? What conclusions can be drawn about light conditions necessary for the growth of bean seedlings? Do these conclusions apply to all green plants (e.g. trees)? Why or why not.

Extensions

Take the class on a forest walk. Observe which trees grow in full or partial sunlight. Using a tree identification guide or www.treebee.ca, make a list of the tree species according to their differing light requirements.

Activity #3

Ask students: How much water do you think a plant needs to grow? What would happen to trees if they did not have water? Challenge them to create their own experiments to find the answer, or have them try the following experiment as a model:

Step 1 Line three identical clear containers with paper towels, cotton batting, or sawdust. Plant four to five Lima bean seeds approximately 2.5 cm from the bottom of each container. Add the same amount of water to each container.

Step 2 Have your class decide how much water each container will receive on a daily basis (e.g. none, 50 mL, 100 mL). Label the containers accordingly. Place all the containers in the same location in the classrooms. Keep all other variables (e.g. light, temperature) constant.

Step 3 Encourage students to predict what will happen. Record any predictions.

Step 4 Have students water each container daily with the prescribed amount of water for a period of three weeks. Observe daily and record observations.

Step 5 Discuss as a class what plant grew best. How much water did it receive? What conclusions can be drawn about the amount of water required for best growth?