Plant Secrets

Standards of Learning
Science 6.1, 6.2, 6.8, 6.9, LS.1, LS.3, LS.4, LS.6, LS.7, LS.9, PS.5

Objective
The student will:
- determine what factors are necessary for plant growth and measure and compare plant growth under different environmental conditions.

Materials
- 50 pea, bean, or alfalfa seeds
- Paper towels
- Potting soil
- Large jar
- 15 to 20 planting containers
- Tape/Permanent markers

NOTE: Approximately 3 weeks before beginning the activity, place about 50 bean, pea or alfalfa seeds in a clear jar on a layer of damp paper towels and put the jar near a window. Monitor the seeds daily and keep the paper towels moist.

Background Knowledge
Farmers produce plant crops that are suited to the climate and soil for their area. This is to insure maximum yields of the food and fiber products, while conserving natural resources and helping to protect the environment. Well suited plants need less added chemicals and do a better job of holding soil in place. Using the scientific method, students will set up an experiment to determine what factors are necessary for plant growth and measure and compare plant growth under different environmental conditions.

Germination is when the seed sprouts and begins to grow. It is important for your students to know that it starts right when there is a bud present from the seed. Explain to your students that their sprout will need a while to grow and that every plant is different in the amount it takes for them to get to maturity. Ask them what their plant will need to grow. All plants need water, light, temperature, time, soil (nutrients), oxygen, and space to grow to full maturity, which is something you can show your students as they are creating their own dirt baby. The process that their plant is going to go through is also something that should be talked about and monitored for a few weeks. All plants go through about the same cycle of sprout, growth, flower, and fruit. However, it is important to also point out to your students what their plant parts are since they will not have flowers or fruits. The basic parts of the plant to point out are roots, leaves, stem, flower, seeds, and fruit. Make sure to point out that not all plants have every part.

Procedure
1. Discuss with students what seeds need to sprout and develop. Seedlings will be ready for experimentation when they have developed leaves and roots. (Germination rates vary by seed type.)
2. Introduce or review the concept of the scientific method.
3. Divide the students into five research teams and have students name their groups. Ask what factors they think are necessary for plants to grow. Have each team develop a

hypothesis to test. Invite the teams to devise experiments to test whether or not plants really need specific elements to grow. Help teams to think through each step of their experiment and to predict what might happen. Then, help them construct and conduct their experiment. Here are two sample experiments.

A. **Hypothesis-** Plants need direct sunlight for healthy growth.
Control- Plant three seedlings in three separate containers of potting soil. Label these containers "control." Place them near a window or other light source. Water as needed.
Test for Light- Plant three seedlings in three separate containers of potting soil. Label the containers: "No Light," "Low Light," "Bright Light," Place them in appropriate places. Water as needed.

B. **Hypothesis-** Plants need adequate water for healthy growth.
Control- Plant three seedlings in three separate containers of potting soil. Label the containers "Control." Place them near a window or other light source. Discuss the amount of water that is necessary for optimum plant growth. Water these plants accordingly.
Test for water- Plant three seedlings in three separate containers of potting soil. Label the containers "No Water," "Low water," "Too Much Water." Discuss exact amounts to water each container. Water accordingly. Place them near a window or other light source.

4. Have the groups set up their experiments as designed and test their hypothesis. Direct them to select seedlings that are all nearly the same size before planting their control and test subjects. This will insure that the results are not skewed by starting with seedlings of different sizes.
5. As the plants begin to grow, graph their heights. Students can measure the plants' heights with rulers and transfer the measurement to graph paper. Graph the plants daily or weekly.
6. Discussion questions:
   - Which plants grew the most? Which grew the least?
   - What other differences did you observe among the plants?
   - What happens if a plant doesn't get enough sunlight? Water? Soil?
   - Which parts of the plants seemed most affected by lack of sunlight? Water? Soil?
   - If you were going to plant a tree on the school grounds, where might you plant it? Why? (Look for a place with the right conditions: sunlight, air, water, soil, room to grow.)
   - If you were to plant a tree on the school grounds, how might you benefit from it? (aesthetics, attracts animals, fruit, blocks winds, provides shade, and provides oxygen)

Extension

Arrange a visit to a nursery or orchard to see the trees in various stages of growth and to find out how they control the various needs of plants to grow what they want at what ever time.
Have students try propagating from a plant cutting or tree seed they find.
Talk about biotechnology and the role it plays in plant production. (Corn can grow closer together, disease resistant, drought resistant etc.)
Talk about the different varieties of plants, fruits, and vegetables. What are their different needs, where do we produce them in this country and why.
Talk about the green belt and how it applies to the United States and world trade.

This lesson adapted from Tennessee AITC.