



4-H Plant , Soils, and Entomology Curriculum



Exploring the World of Plants and Soils

Project Book 3

Sprouting Out and Growing Up



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Sprouting Out and Growing Up

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Behme, R.L. (1992). *Incredible Plants: Oddities, Curiosities, and Eccentricities*. Sterling Publishing Co., Inc. New York, N.Y.

Exploring the World of Plants and Soils: 4-H Plant and Soil Science Project Series. National 4-H Council , Chevy Chase, Md.

Stern, L.R. (2000). *Introductory Plant Biology*. McGraw Hill: Boston, Mass.

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Sprouting Out and Growing Up

Note to Project Helpers

Sprouting Out and Growing Up is the second Project Book in the Exploring the World of Plants and Soils series. This Project Book looks at environmental and internal factors that affect plant growth. It is written to interest youth aged 12 to 14.

The *Exploring the World of Plants and Soils* Project Books include:

It's More Than Just Dirt

Stems and Stamens

Sprouting Out and Growing Up

Exploring the World of Plants and Soils Project Goals

The objectives of this series are to give young people the opportunity to:

- Learn basic facts about plants and soils including plant growth factors, plant reproduction, plant characteristics, how people utilize plants, and the function and characteristics of soil.
- Gain knowledge about plants and soils through experimentation and exploration.
- Stimulate an interest in gardening, plants, soils, and the natural world.
- Appreciate human accountability towards responsible earth stewardship and environmental decision making.
- Relate to life cycles and other cycles found in nature.

Project Helper's Role

For youth to gain the most from this learning experience you should:

- Review the **Sprouting Out and Growing Up** Project Book.
- Support the youth as he or she sets goals and completes each activity.
- Play a proactive role in selecting activities, assisting in activity completion, and answering questions.
- Help the young person to think about what s/he is experiencing and learning through active listening and open-ended questioning.
- Encourage the youth to keep a Project Journal to document activity record-keeping requirements, answer activity questions, and record personal thoughts and ideas.
- Serve as a resource person to help connect the young person to the community, resource materials, and others knowledgeable about plants and soil.

These experiences can be fun and educational for both you and the young person who takes on this challenge. You don't have to be an authority on plant and soil science to be a leader in this project, but you do need the enthusiasm and desire to help the youth learn and grow as s/he explores the world of plants and soils.

What's Inside

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As you participate in the *Sprouting Out and Growing Up* project activities you will have many interesting and exciting experiences learning about plants and the many internal and external factors that affect their growth.

Here is a look at the various sections found in each activity:

Skills: The 4-H life and science process skills practiced as you do the activity. You will also have many opportunities to share what you learned with others.

Educational Standards: The Virginia Standards of Learning (SOL) for life sciences (LS), mathematics (Math), and language arts (LA) and the National Science Standards (grades 5 to 8) addressed by the activity.

Achievement Check: The skill you should learn by finishing this activity. Keep working on the activity until you have mastered each skill.

Materials: The supplies and equipment needed for each activity.

Let's Investigate: The exploration or experiment you carry out to learn about plants and soil.

The following information is found in each activity:



Considering Plants
and Soil

Considering Plants and Soil: Questions you answer and discuss with your helper that are related to what you have learned about plant parts, plant life cycles, and plant reproduction.



Diggin' In

Diggin' In: The information needed to help you complete the activity.



Branching Out

Branching Out: Additional activities to help you utilize and understand what you learned in the activity.



Cool Connections

Cool Connections: Interesting facts about plants and soil.



Word Power

Word Power: New words to learn and use. New words are found in bold print in the activities. Definitions are found in the glossary at the end of this book.

Project Guidelines

To complete the *Stems and Stamens* project you must:

- Select a 4-H Project Helper
- Complete a minimum of four Required Activities and four Optional Activities in the *Stems and Stamens* Project Book
- Participate in a minimum of two Leadership Experiences
- Participate in a minimum of one Service Learning activity
- Keep a Project Journal

4-H Project Helper

Select an adult project helper to support and assist you with these activities. This person may be a parent, family member, 4-H project leader, teacher, neighbor, or friend. The choice is yours. As you do the activities, discuss the activity process and your conclusions with your helper. Ask your helper to assist you throughout this project. Your helper can assist you as you set your project goals, discuss activity questions with you, and help you locate resources.

Name _____ Phone _____ Email _____

Project Activities

Carry out at least four Required Activities located under Let's Investigate. Ask your helper to date and initial this log as you complete the activities.

Required Activity	Date Completed	Helper's Initials	Required Activity	Date Completed	Helper's Initials
Building Strong Plants	_____	_____	Rooting Revelry	_____	_____
You Are My Sunshine!	_____	_____	How Low Can You Go?	_____	_____
Looking for Light	_____	_____	Concerning Cotyledons	_____	_____
Total Transpiration	_____	_____	Growing Roots in the Air	_____	_____
Airing Our Differences	_____	_____	Old Seed, New Seed	_____	_____
Plants in Battle	_____	_____	How Do They Do It?	_____	_____

Optional Activities

Carry out at least four Optional Activities located under Branching Out and list them here.

	Date Completed	Helper's Initials
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Leadership Experiences

Select and participate in at least two of these leadership experiences or devise one of your own. A leadership experience requires the organization of and the participation in an event, presentation, or tour.

Leadership Experience	Date Completed	Helper's Initials
Give a demonstration on plant growth needs	_____	_____
Teach someone something about plant adaptations	_____	_____
Plan a tour of a greenhouse	_____	_____
Attend a gardening demonstration	_____	_____
Give a speech on a plant subject	_____	_____
Exhibit a plant project	_____	_____
Give a seed planting demonstration	_____	_____
Teach someone something about plant tropisms	_____	_____
Other Learning Experiences:		
_____	_____	_____
_____	_____	_____
_____	_____	_____

Service Learning Experience

Select and participate in at least one of these service learning experiences or devise one of your own. A service learning experience requires that you do something for someone in your community.

	Date Completed	Helper's Initials
Plant something to improve the environment	_____	_____
Share something you have grown with someone	_____	_____
Plant a vegetable garden and share the produce with a food bank, neighbor, or family	_____	_____
Gather flowers to share with an elderly person	_____	_____
Other Service Learning Experiences:		
_____	_____	_____
_____	_____	_____
_____	_____	_____

Project Journal

Keep a Project Journal to document activity record-keeping requirements, answer activity questions, and record personal thoughts and ideas.

Activity 1. Building Strong Plants

Have you ever thought about how you use plants in your everyday life? Did you know that the air you breathe is recycled through plants, and many of the clothes you wear are made from plant fibers? Or, that the food you eat comes from plants, and items such as medicines, luxury items, beverages, and fuel come from plants? We are dependent on plants for our continued existence on earth; therefore, it is important for us to care for and understand the plants in our world.

Let's Investigate

Plants Need Soil Nutrients

Many things in nature help or hinder plant growth. These factors include such things as the type of soil present, air quality, water quality and availability, climate, temperature, and the availability of light. These environmental factors are components of every plant's habitat or environment. Environmental factors affect the growth and health of a plant through every stage of its life.

One important environmental factor that affects plant growth and reproduction is the presence and availability of soil **nutrients**. Soil nutrients are used by plants as components of plant cells and life processes. Every soil type differs in its ability to provide the nutrients plants need (refer to the **It's More Than Just Dirt** Project Book). This activity demonstrates plants' need for soil nutrients.

1. Cut off the bottom three inches of two milk cartons or use two 6-inch pots. Punch holes in the bottoms of the milk cartons for water drainage.
2. Fill the cartons with soilless potting mix (most potting mixes contain very few plant nutrients).
3. Plant four bean seeds 1 inch deep in each carton.

Activity: Demonstrate the importance of soil nutrients in healthy plant growth

Life Skill: Acquiring and Evaluating Information – Create data gathering processes

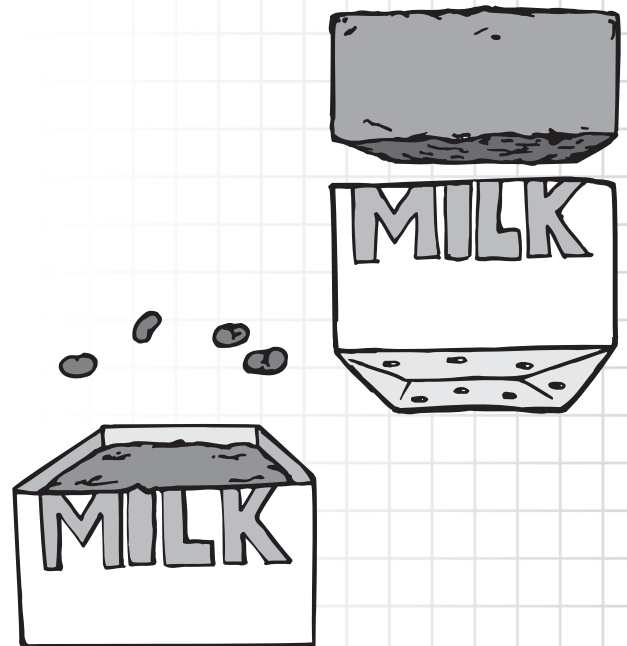
Science Process Skill: Experimenting and controlling variables

Achievement Check: Explain a plant's need for soil nutrients

Virginia SOL: LS.4a and c; LA 6.2, 7.1

National Science Standard: All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.

Materials: two milk cartons or two 6-inch pots, **soilless potting mix**, bean seeds, masking tape, marker, liquid fertilizer



- Using the masking tape and marker, label one container "No Nutrients" and the other container "Nutrients."
- Water thoroughly and place in a sunny windowsill. Water when necessary.
- When the growing bean plants have put on their first set of **true leaves** feed the container labeled "Nutrients" with a liquid fertilizer according to the package directions. Continue to feed and water these plants as directed for four weeks.
- Do not feed the plants with "No Nutrients" step, but continue to water them when necessary for four weeks.
- Make a prediction as to how these plants will grow under the different fertilizer treatments. Record your prediction in your journal.
- Measure and record the growth of your plants every week. Describe the color, stem strength, and overall health of the plants as they mature.
- Compare your observations and results with your prediction. What were the differences in plant height? Stem strength? Green color? Overall health? Why do you think the application of soil nutrients improved plant health? Share what you learned about plant nutrients with your helper.



Diggin' In

Soil Nutrients

Most plants need fifteen (15) elements from the soil to sustain growth. The elements used in large amounts are nitrogen, potassium, calcium, phosphorus, magnesium, and sulfur. The nutrients used in very small amounts are iron, sodium, chlorine, copper, manganese, cobalt, zinc, molybdenum, and boron. Plants need soil nutrients to grow and function properly. Nutrients are used in the structure of plant **cells** and play a part in life processes such as photosynthesis, reproduction, and growth. Gardeners and farmers realize that a **fertile soil** is needed for healthy plant growth. They often add and replenish soil nutrients in the form of **fertilizers, manure, and compost**.





Considering Plants and Soil

Let's Talk

What function did the bean plants' roots perform in this activity?

Why are healthy plant roots crucial to healthy plant growth?

Let's Reflect

How are the vitamins that people take similar to the nutrients plants need?

Fertilizer is often called "plant food." Is fertilizer plant food, or is the sugar produced by photosynthesis the plant's food? Why or why not?

Let's Use It

Where do people and animals obtain the nutrients they need for healthy growth?

How are the nutrients you use for healthy living related to the availability of soil nutrients?



Branching Out

1. Find out how plants that do not live in soil, such as bromeliads and orchids, obtain their nutrients. Start a portfolio of "Unusual Plants" by drawing pictures of these plants. Label each picture with the plant's name and a paragraph describing its unusual growing requirements. Share your portfolio with your helper.

2. Fertilizers are described by three numbers such as 10-10-10 or 20-5-5. These numbers tell the nitrogen-phosphorus-potassium content of the fertilizer. A 10-10-10 fertilizer contains 10% Nitrogen, 10% Phosphorus, and 10% Potassium. Find out why these three nutrients are so important to plant growth. Share what you learned with your group or helper.



Cool Connections

Some bacteria and fungi growing on plant roots can actually take nitrogen from the air and share it with the plant! These are lucky plants!



Word Power

Cells

Compost

Fertile soil

Fertilizer

Manure

Nutrients

Soilless potting mix

True leaves