Science
Grade 3

Unit 4
PLANT GROWTH and DEVELOPMENT
(based on STC Kit)

INTRODUCTION

Plants are organisms that can reproduce and survive if they live in environments that meet their basic needs. Plants need to find ways to obtain water, air, nutrients and protection in the areas in which they live. Some plants live on land and others live in water. Sometimes, plants can adapt to their environments in order to find survival. Understanding how plants survive can help us gain a greater understanding of living things.

SCIENCE STANDARDS AND INDICATORS

Content Standard 2.2: Plants change their forms as part of their life cycles.

A19 Describe the life cycles of flowering plants as they grow from seeds, proceed through maturation and produce new seeds.

A20 Explore and describe the effects of light and water on seed germination and plant growth.

Content Standard 3.2: Organisms can survive and reproduce only in environments that meet their basic needs.

B3: Describe how different plants and animals are adapted to obtain air, water, food and protection in specific land habitats.

B4: Describe how different plants and animals are adapted to obtain water, food and protection in water habitats.

SCIENCE INQUIRY: Scientific inquiry is a thoughtful and coordinated attempt to search out describe, explain and predict natural phenomena.

SCIENCE LITERACY: Science literacy includes speaking listening, presenting, interpreting, reading and writing about science.

SCIENCE NUMERACY: Mathematics provides useful tool for the description, analysis and presentation of scientific data and ideas.

EXPECTED PERFORMANCES

BINQ.1 Make observations and ask questions about objects, organisms and the environment.
BINQ.4 Employ simple equipment and measuring tools to gather data and extend the senses.
BINQ.6 Analyze, critique and communicate investigations using words, graphs and drawings.
BINQ.9 Use mathematics to analyze, interpret and present data.

BIG IDEA Plants survive and thrive in environments in which their basic needs are met.

Key Vocabulary: environment, spines, thorns, toxins, needle, adaptations, stems, leaves, roots, pollination, fertilize, pollen

LINKS TO OTHER STANDARDS

MATH
4.1.a Design surveys for the collection of data and justify conclusions drawn from the data.
4.2.a Analyze data to identify a typical element or event.
4.3.a Use samples and simulations to determine probability, and to make and test predictions.

ESSENTIAL KNOWLEDGE:

- Plants have physical and behavioral adaptations that allow them to survive in certain environments.
- Plants have adaptations for getting the sunlight they need to survive. Examples include growing or leaning toward a light source, and sending out tendrils to get themselves taller than neighboring plants.
- Plants have adaptations for protection from predators. Examples include spines, thorns and toxins.
- Plants have adaptations for surviving in different environmental conditions. Examples include dropping leaves in winter, when sunlight and water are limited, having needle-shaped leaves that shed snow, and surviving drought by storing liquid in large or thick stems.

CONCEPTS

- Many plants follow a life cycle that begins with growth from a seed and proceeds through the production of seeds.

- Plants have distinct stages in their life cycle.
- To live and grow, plants need light, water and nutrients from the soil.
- Flowering plants must be pollinated in order to produce seeds.
- Many plants are pollinated by bees.
- A flower's pollen sticks to a bee, but some rubs off when the bee feeds at other flowers.
- One seed produces one plant; one plant can produce many seeds.

SKILLS:
- Planting and caring for *Brassica rapa*.
- Observing, describing and recording changes in plants.
- Comparing and discussing changes occurring in plants over time.
- Measuring and recording the growth of plants.
- Using graphs to display and compare growth patterns.
- Predicting future growth from observations and measurements.
- Reading to learn more about plants.
- Communicating results and reflecting on experiences through writing, drawing and discussion.

ESSENTIAL QUESTIONS TO GUIDE INSTRUCTION AND ASSESSMENT:
- What factors affect plant growth?
- What are the basic needs of plants?
- How do plants get their basic needs met?
- What makes plants grow and flourish?
- What predictions can be made about future plant growth from observing a plant?
- What is the relationship between plants and other living things (i.e. bees)?

MATERIALS AND SUPPLIES
- STC Plant Growth and Development Kit

OBJECTIVES AND GOALS (as summarized from STC Kit, "Plant Growth and Development")

LESSON ONE
What Do You Know About Plants?
- Students share what they know about plants and discuss what they would like to know.
- The teacher evaluates students' prior knowledge of plants.
- Students practice observation and prediction skills.

LESSON TWO
What is Inside a Seed?
- Students observe how the bean seed changed after being soaked in water overnight.
- Students record their observations.
- Students open the bean and observe inside.
- Students draw and label the parts of a bean seed.

LESSON THREE
Planting the Seeds
- Students collect and organize their own materials for planting.
- Students set up their planters with wicks, fertilizer, potting mix and seeds.

LESSON FOUR
Thinning and Transplanting
- Students discuss the purpose of thinning and transplanting.
- Students learn how to carry out these two tasks.

LESSON FIVE
How Does Your Plant Grow?
- Students learn how to measure their plants to the nearest centimeter.
- Students begin keeping records of their plant growth on a bar graph.

LESSON SIX
Observing: Leaves and Flower Buds
- Students observe two major developments: the true leaves and the flower buds.
- Students record their observations in their notebooks.

- Students review the life cycle of a plant through this stage of development.

LESSON SEVEN
Observing the growth spurt
- Students measure plant height in centimeters and record it on a graph every day for one week.
- Students predict how much their plants will grow each day.
- Students analyze their data on the growth spurt.

LESSON EIGHT
Why are bees important?
- Students share information about bees and raise questions about them.
- Students draw a picture of what they think a bee looks like.

LESSON NINE
Getting a Handle on Your Bee
- Students use a hand lens to observe dried bee.
- Students make bee sticks to be used as a tool for pollination.

LESSON TEN
Looking at Flowers
- Students observe details about a flower's anatomy and identify the major parts.
- Students learn more about the crucifer family.

LESSON ELEVEN
Pollinating Flowers
- Students use the bee sticks to cross-pollinate their plants.
- Students read more about the interdependence of bees and flowers.

LESSON TWELVE
Observing Pods
- Students observe the development of the fertilized pods between Day 17 and Day 35.
- Students record their observations by drawing, writing and graphing.

LESSON THIRTEEN
Making a *Brassica* Model
- Students apply skills they have learned to construct an accurate model of the *Brassica*.
- Students work together on a group project.

LESSON FOURTEEN
Making a Bee Model
- Students construct an accurate model of a bee.
- Students work together on a group project.

LESSON FIFTEEN
Interpreting Graphs
- Students interpret information on two different graphs.
- Students apply math skills to reading graphs.

LESSON SIXTEEN
Harvesting and Threshing the Seeds
- Students harvest and thresh the seeds
- Students count the seeds and compare that number with the original number of seeds planted (8) to determine their profit or loss.

Students think about additional questions they have about plants and experiments that might help answer them.

RESOURCES

Web Sites

http://www.ubcbotanicalgarden.org/potd/flowering_plants/
http://plants.usda.gov/
http://www.geocities.com/EnchantedForest/Glade/3313/
http://library.thinkquest.org/3608/plantsgrow.html
http://school.discovery.com/lessonplans/programs/allaboutplants/
http://www.mbgnet.net/bioplants/
http://www.picadome.fcps.net/lab/currl/plants/default.htm

Literacy Books

The Most Beautiful Roof in the World by K. Lasky
Gardening with Kids by Sharon MacLatchie
Susannah's Garden by Debbie Macomber
Strawberry Girl by Lois Lenski
Garden by Robert Maass
One Bean by Anne Rockwell
A Log's Life by Wendy Pfeffer
Over Under in the Garden: An Alphabet Book by Pat Schories
Have You Seen Trees? by Joanne Oppenheim
Watch them Grow by Linda Martin

Extension Activities

- Developing a class garden
- Creating a school compost bin

Field trips

- Edgerton Park Greenhouse
- Local Nursery
- Outside the school area to plant seeds

Links to United Streaming

How Plants Grow (19:00)
Importance of Plants, The (13:00)
Peep and the Big Wide World: Peep Plants a Seed/ The Root Problem (22:02)

Debbie Greenthumb: How Plants Grow (12:59)
Debbie Greenthumb: Plants Can Be Found Everywhere (13:50)
Debbie Greenthumb: The Importance of Plants To Our World (13:46)
Debbie Greenthumb: Where Plants Come From (12:54)
Plant Parts and Their Uses (12:00)
Plants: A First Look (17:00)
How Plants Grow (19:00)
Plant Habitats Around the World (22:00)
Plant Lifecycles (20:00)
I SPY the Clouds Roll By (12:33)
Let's Explore: In The Woods (19:00)
Desert Habitats (21:00)
Peep and the Big Wide World: Spring Thing/Springy Thingy (22:01)
Blue Dragon, The: Roots and Fruits (13:10)
Play and Discover with Digger and Splat: Green and Growing (17:37)
Play and Discover with Digger and Splat: Growing Up (16:10)