

3-5 Life Science
3-5 Nature of Science



Southern Nevada Regional Professional Development Program

Plant Life Cycle Unit

INTRODUCTION

Observing an organism's life cycle is a natural part of life. Children are curious about their own growth; therefore, being able to observe another organism go through its life cycle gives them a window into their own development.

WHERE'S THE SCIENCE?

All organisms grow and develop during the course of their lives. Organisms must reproduce to ensure survival of their species. There are many different means of reproduction, depending on the organism. Plants can reproduce asexually by breaking off of the parent plant as a bud, through a cutting from the parent plant, or through growth from a root system. Plants can also reproduce sexually with two organisms contributing to the offspring. The lifecycle of a plant starts as a seed, or embryo. Successful germination is the first step in the growth of a seed. The seed is equipped with a food supply (**cotyledon**), a protective coat (**seed coat**), and the **embryo**. Given the requirements to grow- sunlight, water, carbon dioxide and nutrients- the seedling will develop into a plant. The plant will then develop the ability to produce ova and sperm to perpetuate the species through reproduction. This cycle continues on and on.

Hydroponics is used to grow plants in a water-based environment. The plant's roots are placed in a nutrient rich water solution, instead of soil, and are grown in tubs. This is done commercially in greenhouses.

MATERIALS

(per group)

- 4 green bean seeds
- Water
- Coffee filter or paper towel
- Small plastic container with a lid
- Bleach Solution (one cap full of bleach per 1 liter of water, premixed by the teacher)
- Potting soil
- Small wooden dowel
- String
- Small planting pot
- Sticky notes
- Hand lenses
- Small clear plastic cups
- Clear tubs (hydroponics)
- Plant nutrient (www.hydroempire.com)
- Thin foam sheet (used in shipping)
- Science Notebooks

PROCEDURES

Lesson One

1. Show the class a green bean **seed** and ask them if it is alive. Next, ask them to list everything they think they know about the seed. Chart their responses. Share with the class that the seed they are looking at is in a **dormant**, or sleeping stage, waiting for the right conditions to emerge.
2. Introduce the term **organism**. Ask for examples and list them on chart paper where students can see them. Tell students an organism is any living thing, including plants or animals. Show them the seed again and ask if it is an organism.
3. Instruct the students to return to their group with their science notebooks.

4. Distribute the seeds, one per student, and instruct the students to observe and record the seed's properties in their notebooks. Model how to sketch the seed and record the seed's properties on chart paper to post.
5. Tell the students that they will introduce water into the seed's environment to see what will happen. They will do this by placing the seeds in small plastic containers, lined with a coffee filter or paper towel. Once the sprouter is prepared and the seeds have been placed inside, add a small amount of water (adding a small amount of bleach to the water will prevent mold) to the container. Drain any excess water and place the lid on the container. Place a sticky note on the outside of the container with the group name and date listed. Collect the containers and store in an area out of direct sunlight.
NOTE: Make a larger class sprouter to replace any seedlings that may not germinate or are lost to mold. Don't allow students to touch the bleach water or mold.
6. Call the students to the carpet area and discuss what they think will happen to the seeds. Chart their responses and post in a visible place.

Lesson Two

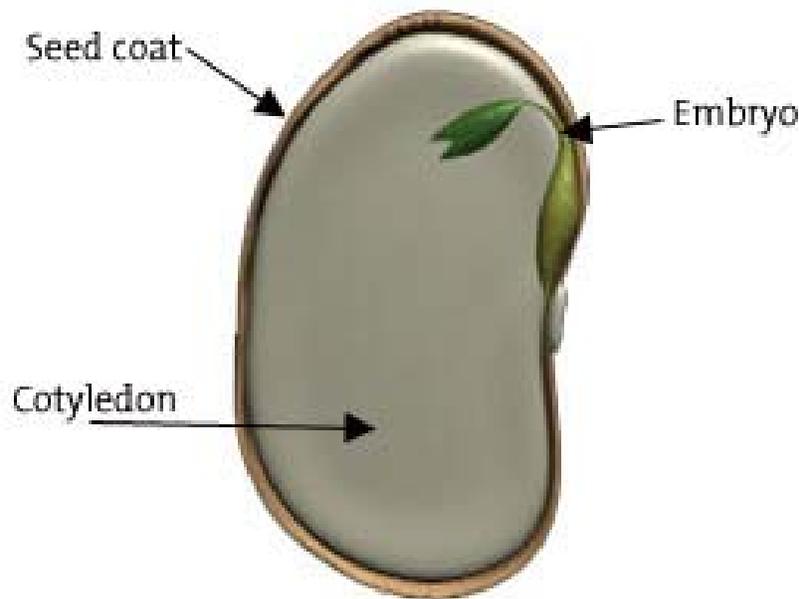
NOTE: Place the seeds in a container of water over night before starting this lesson.

1. Instruct one student from each group to retrieve their sprouter and return to their group. Tell them they will observe the seeds that were placed in the sprouter yesterday. In their science notebook, sketch and record all observations of the seeds.

NOTE: They will do this daily for approximately one week. Once the seeds germinate and start to sprout, they will be ready to plant.

2. Ask the students what they notice about the seeds. Are there any changes? Can you see any parts of the seed that you couldn't see yesterday? Instruct them to place the seeds back in the sprouters for the next step of the lesson.

3. Tell the students that you will give them each a seed that has been soaked overnight to try and identify some of the plant parts. Distribute the soaked seeds (one to each student) and ask the students to briefly observe and record these in their science notebooks.
4. Ask them how many parts they see. Can they label any of the parts? Model how to sketch the seed, using chart paper to record and refer back to at a later date. Use the students' vocabulary to identify the seed parts first, and then introduce the appropriate vocabulary. See diagram below.



http://www.learner.org/courses/essential/life/images/show4.open_seed.jpg

5. Discuss the purpose for each part of the seed and ask the students how they think this part helps the plant grow. Chart their responses.
6. Instruct one person to add fresh water to the sprouter and drain off the excess. Place the lid back on the container, and return to the materials area. **NOTE:** This procedure will be done each time the students observe the seeds.

Lesson Three

1. Start the lesson by telling the students that today they will be placing their germinated seeds in a new environment. Ask them what they think plants need to grow. Chart their responses.

NOTE: Typically students will reply: water, sunlight, and soil. Plants do not need soil, they need the nutrients from the soil to thrive.

2. Ask the students if they think the seedlings will grow without placing them in soil. Tell them that they will be placing them in water and adding nutrient to the water. The nutrient is what the plants would naturally take out of the soil.

3. Give students the option to plant their seedlings in soil, or hydroponically. If they choose to plant in soil use the following directions:

1. Place the soil in a small planter 2 cm below the brim.
2. Use a spoon to dig a small hole to place the seedling in the soil.
3. Place the seedling in the hole with the root end down and the shoot end up.
4. Cover the root with soil and pat down to secure the seedling.
5. Add a small amount of water to moisten the soil.
6. Place in a sunny location.

NOTE: Up to 4 seedlings can be placed in one small planter.

If they choose to plant hydroponically, use the following directions:

1. Place distilled tap water in a small clear basin.
2. Add one nutrient tablet to the water.
3. Place a piece of foam with a notch cut out on top of the water.
4. Insert the seedling into the notch; root side down, leaves up.
5. Place in a sunny area.
6. As the plants grow, place the wooden dowel (or straw) on the outside of the tub and secure with a piece of duct tape.

Then secure the stem of the plant to the dowel with a piece of string.

NOTE: Many seedlings can be placed in one set up. It is easiest to do this by rearranging groups into students who want hydroponics vs. soil.

4. Tell the students that they will plant their seedlings using one of the posted methods, hydroponically or in soil. Ask them to predict what they think will happen after they plant their seedling. Record this and other ideas in the science notebook.
5. Tell the students that one person from the group will be responsible for watering the seedlings and monitoring the water level for the hydroponics setups. They will rotate this duty daily.
6. Tell the students that they will create a log to record the progress of their seedlings.

NOTE: The lifecycle of a bean plant takes about 8 weeks.

7. Close the lesson by discussing what they learned about what plants need to grow. Record the students' responses and further questions on chart paper and post.

NOTE: Periodically ask the students to meet and discuss what they are recording in their plant logs. Once a week, have the entire group observe the plants and sketch a diagram in their science notebooks. Digital pictures also work well to document growth. Label the plant parts appropriately and discuss as a class. When the flowers emerge, point them out and ask the students what they think their purpose is in the growth of the plant.

Lesson Four (after the plants have completed the lifecycle)

1. Instruct the students to remove one bean pod from their developing bean plants and return to their groups.
2. Tell the students to observe the pod and record/sketch what they notice in their science notebooks. Ask them to predict what they think is inside the pod.
3. After a brief discussion about the growth of the seed to plant to bean pod, have them open the pod to see what is inside. Refer

back to the original seed that was planted. How are these seeds alike/different than the original seed? Introduce the term “lifecycle” and relate it back to the growth and development of the bean plant.



http://etc.usf.edu/clipart/19800/19872/beanlife_19872_md.gif

4. Close the lesson by having students identify other lifecycles. They may then choose one to draw the lifecycle of the organism they chose. Share with the class and post.

Additional Resources

http://www.bbc.co.uk/scotland/education/bitesize/standard/biology/world_of_plants/growing_plants_rev2.shtml

Interactive website on the parts of a plant.

www.fossweb.com

Interactive website on the lifecycles of organisms.

Haydon, J., *Plants*. Rigby, 2003

ISBN: 0-7578-8348-6

Gibbons, G., *From Seed to Plant*. Holiday House, New York, 1991.

Delta Science Readers *Classroom Plants* ISBN-10: 1-59242-516-X
Delta Science Readers *Plant and Animal Life Cycles*
ISBN-10: 1-59242-258-6

Vocabulary

Cotyledon: The “seed leaf” that provides the germinated seed with food.

Dormant: When something is resting or inactive.

Embryo: The undeveloped plant within a seed.

Flower: A structure from which fruits and seeds develop.

Fruit: A structure of a plant in which seeds are found.

Germinate: When a seed sprouts, or starts to grow and develop.

Growth: When an organism gets bigger and more complex.

Hydroponics: Growing plants without soil in a water-based nutrient solution.

Life cycle: The sequence of changes undergone by an organism as it develops from its earliest stage to the same stage in the next generation.

Nutrient: A material used by a living organism to help it grow and develop.

Organism: Any living thing, including all plants and animals.

Reproduce: To produce new plants or new animals.

Root: The part of a plant that grows downward in the soil. Roots provide support and take up water and nutrients.

Seed: The structure in a fruit that holds the undeveloped plant, or embryo.

Seed coat: The outer covering of a seed.

Seedling: Young plants that grow from seeds.

Thrive: To grow and be healthy.

Safety Reminder

Students must wash their hands after handling any organism.

Check your district safety manual for the process of handling and storing bleach.

Nevada State Science Standards

L5A1 Students know some physical characteristics and behaviors that are inherited in animals and plants. E/S

L5A2 Students know reproduction is an essential characteristic for the continuation of every species. E/S

L5A3 Students know that, while offspring resemble their parents and each other, they also exhibit differences in characteristics. E/S

L5B1 Students know plants and animals have structures that enable them to grow, reproduce, and survive. E/S

L5D1 Students know animals and plants can be classified according to their observable characteristics. E/S

N5A1 Students know scientific progress is made by conducting careful investigations, recording data, and communicating the results in an accurate method. E/S

N5B3 Students know the benefits of working with a team and sharing findings. E/L