

It's Not Easy Being Beans

STEM Focus Area: Life Cycle of Plants

Learning Goal: Youths will understand the life cycle of flowering plants.

LEARNING ENVIRONMENT

Activity Duration: 1-1.5 months - Day 1 - 45 minutes, Days 2-45 - 10 minutes each day.

Class Size: Any size

Minimum Group Size: 2

Type of Space: Indoor or Outdoor

Age of Youth: Grades 5-7

Guiding Question: *What is the question to explore OR the problem or challenge to solve?*

What factors are necessary for plant growth?

Youths will investigate the life cycle of plants by growing plants and observing the effects on plants when they alter different variables.

Through this activity, youth will:

- Investigate what conditions provide the best conditions for a plant to grow
- Observe and record observations each week what their plant looks and taking measurements.
- Share and communicate the data they have collected with the large group.
- Draw conclusions and relationships between the conditions their plant was under and how they compared with the conditions of the others.

Facilitator Checklist in the Learning Environment:

- Predict and hypothesize**
- Develop and use models**
- Measure materials**
- ✓ **Observe**
- ✓ **Investigate**
- ✓ **Record observations**
- Analyze and infer**



- ✓ **Share and communicate data**
 - Interpret data
 - Test and revise
- ✓ **Draw conclusions and relationships**
- ✓ **Have voice and agency, make decisions and guide their own learning**

PREPARATION

Facilitator prep:

Facilitators will need start plants about a week before experiment. Take a jar or plastic cup (1 for every plant you need to start), place a paper towel in the cup, fill with $\frac{1}{2}$ cup of water and drop in a bean seed and place in a warm, sunny spot. After 5-7 days, a seedling should have grown.

Literacy Connection: Great books to get youth support learning about plant life cycles! (*available on Amazon*).

- The Magic School Bus Plants Seeds: A Book About How Living Things Grow by Joanna Cole
- Red Leaf, Yellow Leaf by Lois Ehlert

Materials

- Seed starter pots – a variety of sizes. Check with your local green house to see if they have any starter pots that you can use.
- Radish seeds
- Magnifying glasses
- Paper towels
- Spray bottles
- Measuring cups or scoops
- Access to regular sunlight
- Access to water
- Potting soil
- Sand
- Thermometer
- Measuring tape or ruler
- Permanent marker
- Shelf to store growing plants on
- Plant observation worksheets

Room: Day 1 of this activity can take place indoors or outdoors. If indoors, youth will need tables to work on or trays to contain messes if working on the floor. Having a substrate table with bags or buckets of growing medium will be helpful so children can help themselves. There will need to be a pre-determined location for plants to be stored throughout the month that is easily accessible so students can make observations each day.

Content: A plant is a living system. Just like animals, plants have basic needs in order to survive. A plant's basic needs are: sunlight, air, water, nutrients, and space in the amount suitable to that plant.

Animals get their energy from the food they consume. Green plants get their energy from the sun. The process is called **photosynthesis**. Sunlight activates the chlorophyll in leaves to convert raw materials from soil and air into carbohydrates (starches and sugars), which are the plant's food.

Just like animals, water is important to plants because it is a primary component of the material that makes up the plant's structure. Just like in animals, water is what helps give cells their shape. Water also helps transport nutrients from the soil to the plant's roots.

Plants need a growing medium (such as soil) for support and to provide nutrients (raw materials to make food). Most plants need soil. The type of soil necessary to sustain a plant depends on characteristics such as: texture (compact or porous), water-holding capacity, acidity, and population of beneficial soil organisms.

Plants also need space to grow. If they do not have enough space and if they must compete with neighboring plants for nutrients, light and water, plants may find it difficult to grow or survive.

Inquiry:

Your primary goal as facilitator is to encourage youth to explore and observe the life cycle of plants. You can prompt those discussions with questions like the following:

- What variable are you changing?
- How do you think this will affect your plant?
- Do you think it will grow better or worse?

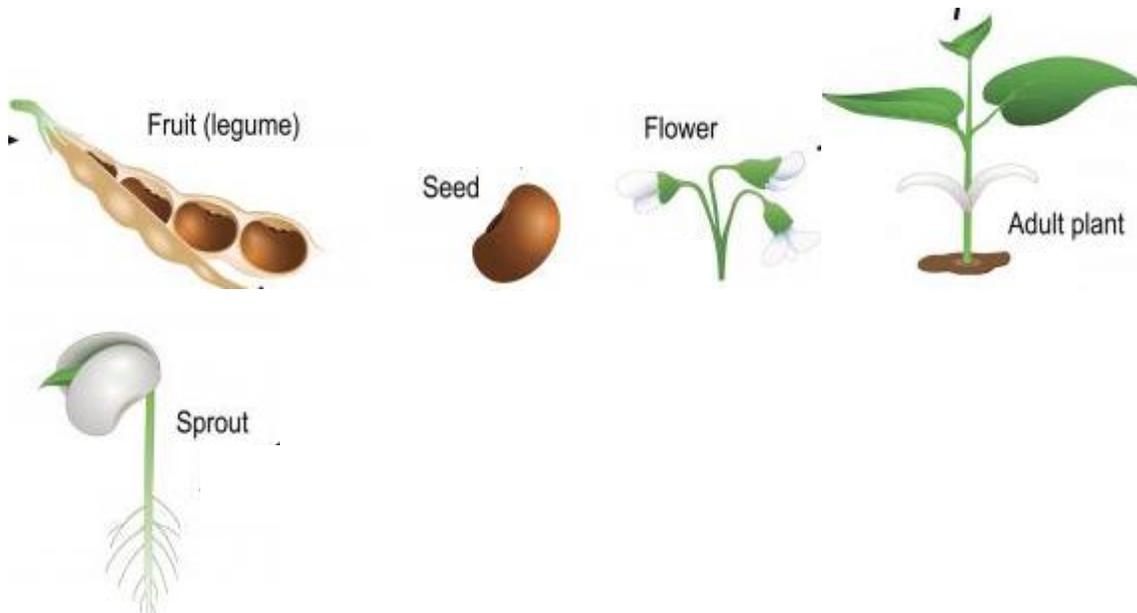
Facilitator Checklist for Preparation:

- ✓ Organization: I practiced the activity/technology, prepared materials/extras/place to record youth ideas, completed an activity (including timings).
- ✓ Materials: Materials are appropriate for teaching the learning goals; youth will be able to use them and will think they are appealing.
- ✓ Space Utilization: The space is set up appropriately for the activity and there will be no safety issues or distractions.
- ✓ Relevance: I have researched why the content matters to youth's everyday lives.

- ✓ Content Learning: I have become familiar with the content.
- ✓ Inquiry: I have become familiar with how authentic, age-appropriate inquiry practices look in this activity.

INTRODUCTION TO ACTIVITY (10 MINUTES)

Have youth build a life cycle model on a white board with the following pictures.



Then review the basic needs of plants to survive: air, growing medium, water, sunlight and adequate space

Explain that they are going to test the effects on plants when they change one of these factors.

Facilitator Checklist for Introduction to Activity:

- ✓ Space Utilization: I will use the space informally avoiding the lecture hall format.
- ✓ Purposeful Activities: This intro section gets youth on track for the learning goal.
- ✓ Content Learning: If age appropriate, I will accurately present content.
- ✓ Inquiry: In this or another section of the activity, youth carry out one or more inquiry practices.
- ✓ Relationships: I will make each youth feel welcome.
- ✓ Relevance: In this or another section, I will guide the youth in a sustained discussion of how the activity relates to their everyday lives.
- ✓ Youth Voice: In this or another section, I will allow youth the opportunity to make decisions about their learning experiences.

ACTIVITY ENGAGEMENT (25 MINUTES)

Split groups into small teams of 2-4 youth. Provide each youth with 5 bean sprouts. Tell them to measure their sprouts before planting them and record the lengths for comparison in the future.

Teams will need to determine one plant as a control. With this plant they will need to set parameters to which they will use: amount of water and frequency given, amount of sunlight given, growing medium and space. Then they will need to come up with how they are going to test the other plants. Examples include: one plant receives no water, one plant receives no sunlight, one plant is planted in sand, one plant is planted in a container half the size of the control plant. Tell them they can only change one variable per plant. The rest of the variables need to match the control plant.

Each day, youth will observe their plants, recording measurements and making notes of what their plant looks like.

Facilitator Checklist for Activity Engagement:

- ✓ Space Utilization: I will use the space informally avoiding the lecture hall format.
- ✓ Participation: All youth will have access to the activity.
- ✓ Purposeful Activities: This core section helps youth to move toward the learning goal.
- ✓ Engagement: This activity has youth physically engaged with their hands and their minds.
- ✓ Inquiry: In this or another section of the activity, youth carry out one or more inquiry practices.
- ✓ Reflection: If appropriate, I will ask youth questions during the core activity that will help them make sense of what they are learning.
- ✓ Relationships: I will take steps to share my enthusiasm and create a nurturing, safe learning environment.
- ✓ Relevance: In this or another section, I will guide the youth in a sustained discussion of how the activity relates to their everyday lives.
- ✓ Youth Voice: In this or another section, I will allow youth the opportunity to make decisions about their learning experiences.

FINAL REFLECTION AND RELEVANCE (5 MINUTES)

On the final day, youth should come together as a large group to share the results of their experiments.

- What variables did you test?
- Which plant grew the best?
- What effects is changing the variables have on each plant?
- Where would be the best location for these plants if we planted them outside the school?



To help youth connect this lesson with their real lives, prompt discussion with these questions.

- Has anyone ever planted a garden? Tell us about it.
- What types of environments do plants need?
- What do Iowa farmers need to consider when planting their crops?

Facilitator Checklist for Activity Reflection & Relevance:

- ✓ Space Utilization: Again, I will use the space informally.
- ✓ Participation: I will prompt youth who do not have access to the activity to participate.
- ✓ Purposeful Activities: The closing section helps youth to reach the learning goal.
- ✓ Content Learning: I will help youth make connections between different ideas. I will create opportunities for youth to ask questions/provide ideas that show a deeper level of understanding.
- ✓ Inquiry: In this or another section of the activity, youth carry out one or more inquiry practices.
- ✓ Reflection. I will provide youth with a sustained opportunity to make sense of their learning.
- ✓ Relevance: In this or another section, I will guide the youth in a sustained discussion of how the activity relates to their everyday lives.
- ✓ Youth Voice: In this or another section, I will allow youth the opportunity to make decisions about their learning experiences.

REFERENCES:

American Forest Foundation, Project Learning Tree, Pre K-8 Environmental Education Activity Guide, 2012

Plant Observations

Observation date: _____ Observation time: _____

Growing medium used: Sand Potting Soil

Amount of water given: _____ Hours of sunlight: _____

Temperature: _____ Plant height: _____

Other observations: _____

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Amount of water given: _____ Hours of sunlight: _____

Temperature: _____ Plant height: _____

Other observations: _____

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