Growing Plants

Big Ideas of Science: *Change can be fast or slow.*	
Topic: Plants	
Objectives: The students will know that • plants have basic needs, including nutrients, air, water, light, and a place with sufficient space to grow. Students will be able to • make repeated observations of an object or event from multiple positions. • develop a question from one or more observations. • predict outcomes based on actual observations and evidence rather than random guesses. • communicate observations and data with simple graphs and pictures, oral and written statements, and with numbers. • answer questions by conducting simple experiments/investigations, using nonstandard measuring units and simple tools, such as a magnifying glass or a balance. A simple experiment is one that changes only one thing at a time (tests only one variable), gives quick results, and provides easily observable changes. • conduct simple experiments/investigations related to plant needs by changing one variable (nutrients, air, water, light, or place to grow) at a time. Students do not need to know the term variable.	
Materials: Bottle biology for each table Plant Dirt	**Cooperative Learning:** Round Table Two Better than One
Essential Questions for Lessons • How do the questions we ask determine the way we find an answer? • How can changes affect the growth of plants?	

Engage/Explore

1. Begin the lesson by saying to students the following: "After we discussed the parts of a plant, I was wondering about the parts of a plant and what would happen if a life need was not met. I thought today we might explore this idea a little more. To do this, we are first going to learn about the types of questions scientists explore."
2. Give each table a bottle biology that contains a small plant growing in it. Tell students their job is to individually generate as many questions they have about the object that was

just put on their table (don't tell kids what it is). They should put one question on one index card. Give them only a minute to do this.

3. Next have teams share out their questions they generated using the cooperative learning structure round table (this is where students go around the group and share their questions until everyone has had a chance to share).
4. Next, have the teams share out with the whole class. So have one student from each group share out a few questions.
5. Thank students for their work. Comment on the variety of questions they generated.
6. Tell students that today, they are going to learn how important asking the right question can be for a scientist.

Explain

1. Discuss with students the differences they see in the types of questions they generated.
2. Explain to students that how a question is asked determines how it can be answered. Scientists answer those questions that are experimental in nature. In other words, they make an observation and from their observations they generate questions. Then they design a question to find an answer to their question. So for instance, why is the sky blue is a great question. But how could we find the answer? We can go look it up using the internet or we can talk to a scientists who can tell us the answer. It really is just describing how the sky looks. Other questions are more historical in nature. In other words, they get at information that tells when something was made. Again, these types of questions can be answered by interviewing someone or googling an answer.
3. The last type of questions are the experimental ones. These are what scientists investigate. They use materials to find the answers. Tell the students they are going to design their own questions to investigate. To do this we have to do a little more work.

Extend

Have students go back to the plant in the container. Using the cooperative learning structure "think, pair, share," have students work together to answer the following questions:

- How do you think the seed from which this plant grew changed over time?
- Which grew first: the root or the stem? (*Root)*
- What factors were present to help the seed germinate and grow? *(water, light, warmth, air)*

Guiding the students through the Four-Question Strategy, help them design an experiment to determine which factors affect seed growth. After students have brainstormed materials that can be used in the experiment (question #2), indicate to students which materials are available.

Two Better Than One: For each of the four questions, give students think time and have them record individual answers. After each question, tell students to pair with their shoulder partner and share answers one at a time.. Partner A shares an answer. If Partner B has the same answer, he puts a check mark by it. If he does not have that answer, Partner B adds it to his list. Then Partner B gives Partner A an answer and Partner A check or adds to his list. Partners continue to share answers until the teacher says to stop (about one minute). Students then pair up with their face partners and share their answers the same way.

Four-Question Strategy:

1. What do seeds do? (sit still, grow, swell, germinate, absorb water, grow roots and stems)

2. What materials are available to conduct an experiment on seed germination? (plastic bags/container, water/liquid, seeds, paper towel, soil, location)
3. How could each material be changed to affect how the seeds germinate? (Think of the constants from the previous experiment. How could each be changed?)

Container	Liquid	Seeds	Location
Type of container Sealed or open	Type of liquid Amount of liquid	Type of seed Size of seed Position of seeds (embryo up or down)	Dark or light Cold or warm Soil or water Type of soil

4. How could I measure or describe the response of the seed germination to the change? (seed growth – length of root; time to sprout)

In teams of four, allow students to design and conduct their experiments. You can have one team choose to change having light or no light; you can have one group change the liquid used.

TEAM PROJECT: *Assign lab roles: Principal Investigator who directs others to follow procedures; Materials Manager who does experiment; Reporter who records data; Timekeeper / Clean Up Captain who keeps time and helps clean up. Distribute lab reports and materials.*

Evaluate

After a few weeks of collecting data, discuss the results with students. Be sure to use good science talk to do this.

- What did we change in our experiment?
- What does our evidence say about the affect of light or no light on plant growth? How did the plant change?
- Do you still have questions from your research?

Extension:

- Encourage students to try experiment at home with their parent's supervision using the same materials or changing one of the materials.
- Show students how to graph their data on a class graph. Older students could graph their own data.

Materials

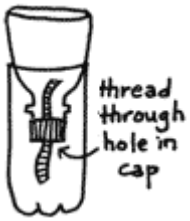
- One 2-liter soda bottle
- One bottle cap
- Wicking material-fabric interfacing or cotton string
- Water, soil and plants

Step 1 – Remove label from the 2-liter bottle. Cut bottle 1 cm below shoulder.

Bottle #1

Step 2 – Poke or drill a 1 cm hole in bottle cap.

Step 3 – Thread a thoroughly wet wick strip through bottle top, invert top, and set into base. Wick should reach bottom of reservoir and thread loosely through cap.



Step 4 – Fill reservoir with water. Add soil and plants to top chamber. To be effective, the wick should run up into soil, not be plastered along a side of the bottle. For better drainage, place a layer of gravel, sand or vermiculite in the bottom of the soil unit. Saturate wick in water, then insert into column threading through the cap.