Plant Growth Challenge
4th Grade

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Benchmarks & Objective:

- LS-1: Compare life cycles of different plants including germination, maturity, reproduction and death
- LS-2: Relate the plant structures to their specific functions (e.g. growth, survival and reproduction).

Materials:

- Science journals
- Sunflower seeds (2/student)
- Potting soil
- Spray bottles
- Plastic cups (2/student)
- Large plastic tub
- Water
- Alternate liquid source (let the students decide)
    - e.g. OJ, Pepsi, flavored water etc.
- Alternate soil source (let the students decide)
    - e.g. sand, pebbles, cat litter etc.

Target Concept:

The target concept is two-fold for this experiment: (a) To let the students design their own experiment totest how plant growth can be affected by changing its environment, and (b) To allow the students to observe what happens to a plant when its environment is altered.

Initial Introduction:

The Teacher should have already covered general plant structure, how a plant's environment affects its growth, and what a plant needs to survive. First, the teacher should prompt the students for the important factors in plant growth (e.g. light, water, nutrients, CO2, temperature). Temperature and amount of available CO2 are hard to adjust in a classroom so these two factors will not be examined. The teacher should have the students make three columns in their journals and write one of the following words in each column: (a) Liquid (b) Soil (c) Light. Next, prompt the students for what we do in an experiment (you're looking for an answer like, "We change things and test their effect"). With that answer, ask the students how they'd like to change the three variables. You only want a couple answers for each variable (good examples include Pepsi, sand, cat litter, no water, no light etc.). The next step is to assign conditions to each student. This step will take some thought as you want to separate the effect of each variable. The key is to make sure everyone has a different set of conditions and that each type of one variable (i.e. liquid, soil, light) is paired to every type of the other two variables. For instance, condition 1 will be water, sand, and light. The other necessary conditions will be: (a) water, dirt,

light (b) water, sand, no light and (c) water, dirt, no light . This allows you to see not only the effect of light on growth, but soil type's effect on growth. The best idea is to pre-limit the number of choices for each type (i.e. liquid, soil, light) and then create a list before class. This will allow you to assign conditions to all the students during the same class. Finally, to ensure that everyone has a plant at the end of the quarter and to offer some comparison, every student will grow a control (i.e. they will use water, potting soil, and light).

Procedure:

Day One

1. Design experiment
2. Assign conditions to each student

Day Two

1. Pass out two plastic cups/student
    a. One cup should be pre-filled with potting soil (henceforth known as cup A)
2. Pass out two seeds/student
3. Have each student partially fill their second cup with whatever soil type they were assigned (henceforth known as cup B)
4. Have the students plant their seeds just below the top surface
5. Have the students make observations
6. Fill spray bottles with whatever liquids were chosen and then have the students spray cup B
7. Have the students use a water spray bottle and spray cup A
8. Place all the cup As and whomever's cup B has 'light' as a condition near the window and out of the way
9. Place all the cup Bs with 'no light' as a condition in a large cardboard box and put it out of the way
    a. The plants still need CO2 so you should cut some holes at the bottom of the sides (this should let in air with a minimal amount of light

Day Three and beyond

1. Add liquid depending on humidity and temperature conditions
2. Have the students make observations every time they add liquid
3. Continue steps 1-2 until the end of the quarter
4. On the last day compile the results and graph the data
    a. You do this so that the students can see, graphically, what effect, if any, each condition had on plant growth

Target Observations:

- Plants require water, nutrients and light to survive
- Plants may or may not adjust to a changing environment
- Plants can germinate, but will never grow if they aren't provided with nutrients, water and light

Final Target Concept:

Plants, like humans and animals, can adjust to changes in environment. However, there are certain things that plants need to survive. If you take any of those away the plant will likely die.

Summary & Discussion:

The teacher can discuss how changes to the Earth's environment (increasing temperatures, increased rainfall) affect the plant life. The teacher can go further to discuss how a loss of plants affects humans and animals and why it's important to not destroy plant life on Earth, be it through deforestation or global warming.