grades 2-8

lesson topic: Seedling Science

source: Common Core Learning Standards for English Language Arts & Literacy
http://www.corestandards.org/ELA-Literacy/RL/introduction-for-k-5

overview

These lessons provide: two experiments for teaching students about germination through controlled experiments. One tests whether soil is necessary for germinating seeds. The other tests whether light is necessary for germination.

objectives

Students will learn:

- the fundamental importance of understanding germination and plant growth S2a, S2b, S2d, S4a
- the organic materials needed for plant germination S3a, S3c
- how photosynthesis drives plant growth S2a, S2b, S2c, S4a, S5a
- experiments that test germination needs S4d, S5a, S8a

materials

For this lesson, you will need:

- potting soil
- seeds, enough for 10 seeds/group
- small pots

resources

Read the content packet:
"Basics of Botany"

learning activity #1

Do Seeds Need Light?

1. Start by asking: "What do plants need to live?" Ask children to share ideas, facts, or experiences to this question.

2. Follow-up with: "What happens if plants do not get light?" Children will probably agree that plants need light or they will die. Now ask the students, "Do seeds and seedlings need light to germinate?"

3. Share with the class the idea that in order for us to answer this question, we need to think and act like a scientist. A scientist takes a question like this and then conducts an experiment to see what really happens and to gather data or facts.

4. Today, we will start an experiment that will take a couple weeks to conduct to see if germinating seeds needs light. We will observe and record what happens to seedlings with and without light.

5. Give each pair or small group of 3 – 4 students, several seeds. Have students start with an exploration of their seeds. How would they describe the seeds?

The New York Botanical Garden

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6. Next discuss with the class that we are going to pot-up the seeds, but that we have to be consistent as a group, because it is a science experiment. Based upon the discussion of technique, have each group pot-up several seeds in several pots using potting soil. Make sure to show them the proper technique for planting. Also, make sure that the students gently water the pots.

7. Ask the students if I want to see if plants need light where should I place them? Most students will recognize that the plants should go in a window or under lights, but they may not realize that they should also test seed growth in the absence of light. If they don't make this realization, then make suggestions by asking questions like "What would happen if I placed some potted seeds in a dark closet?" Based upon their responses explain to the class how we should test this.

8. Have each group make a hypothesis for their experiment (e.g. the absence of light will affect the height of the seedlings), and a prediction (e.g. the seedling in the dark will be shorter than the seedling in the light).

9. Have students place half the pots in a brightly lit area, and the other half in a dark area.

10. During the week, you may need to check on the plants for watering, but try not expose the dark plants to light during this process.

11. After two weeks have the students remove the plants from the light and dark areas. Have them record their observations of both types of plants (i.e. light and dark). What do the leaves look like? What do their stems look like? What color are they? How tall are the plants?

12. Compare and contrast both the light and dark seedlings. Use mathematics to give a quantitative description of both groups, including height of plants, average height for both groups, length of leaves, average length of leaves for each group, etc. Graph the results using bar graphs.

13. What was their original claim? They should look for evidence, which will either support or reject this claim. Did the results support or reject their hypothesis? Was their prediction accurate? Make sure to explain that there is no right or wrong hypothesis.

14. Discuss with the students their observations and try to place their observations in an explanatory context. What was the reason the seedlings appear this way? What affect does light and/or dark have on the growth of the seedlings? Was this a surprising result?

extending the lesson

Have the students return the plants to the lit and dark areas, but place the "lit plants" in the dark closet, and the "dark plants" in the lit area.

After 1 week have the students observe and record what the plant looks like. I think they will be amazed!

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Do Seeds Need Soil?

materials

For this lesson, you will need:

- 1 egg carton per group
- 6 cotton balls per group
- soil
- 12 seeds per group

learning activity #2

1. Start with a refresher about what plants need to live.

2. Follow-up with: "What happens if plants do not have soil?" Children will probably agree that plants need soil or they will die.

3. Children will probably have misconceptions about growth and germination. You may want to ask, "What is germination?" *[process in which seeds swell with water and begin to sprout; usually not green yet].*

4. Discuss with the students how plants may have different needs at different times in their life. Seedlings (young plants) may have certain needs, and mature plants may have others. Now ask, "Do seeds need soil to sprout?"

5. Share with the class the idea that in order for us to answer this question, we need to think and act like a scientist. A scientist takes a question like this and then conducts an experiment to see what really happens and to gather data or facts.

6. Today we will start an experiment that will last a couple weeks to conduct to see if seeds need soil, and to see what happens to they don't have soil.

7. Give each group (pair or small group of 3 – 4 students) an egg carton and 12 seeds. Have students start with an exploration of their seeds. How would they describe the seeds?

8. Next have each students set up their experiment. Explain that we need to find material to grow seeds that is not soil. For young children, you could show them some different possibilities like cotton balls or paper towels.

9. Remind them that we need to test both seeds in soil, and seeds in something other than soil. See if they can devise an experiment *[do not just give them the design]*

10. Most will realize that some of the wells of the carton *[i.e. six]* should have soil, and others should have cotton balls. They then can plant 1 seed per well, and then gently water them all.

11. Now place them in a place that gives the seed all of the other necessities for life (i.e. warmth, light, etc.)

12. After a week check on the seeds. What has happened? How many are growing? How tall are the seeds? Do you think there is a difference?

learning activity #2 (continued)

13. Just as in the previous experiment students are testing a claim, and looking for evidence. Discuss with the students their observations and try to place their observations in an explanatory context. What was the reason the seedlings appear this way? What affect does light and/or dark have on the growth of the seedlings? Was this a surprising result?

14. Ask again "Based upon your experiments do seeds need soil to sprout?" At this point, they may see some differences, but overall the students should realize that seeds can germinate without soil.

extending the lesson

1. Have the students continue to grow the plants for several weeks. Make sure to keep watering the plants.

2. Ask them to record any differences; after a while the "cotton ball" seeds will start to look unhealthy. Now ask them "Why are the seeds in the cotton balls looking unhealthy?" Have a discussion about soil and the minerals that keep plants healthy. Discuss that cotton balls do not have these minerals.

3. Now ask them, "Do plants need soil to grow?"