Soybean Growth: AeroGarden® Observations

Objectives: Students will utilize the scientific method to design an experiment using an AeroGarden® to grow soybeans and keep accurate data and records.

Oklahoma Academic Standards:

Science: 7.LS2.1; 8.LS1.4; 8.LS1.5; 8.LS3.1 ; 8.LS3.2

Teacher Background:

Hydroponics is the process of growing plants in sand, gravel, or liquid, with added nutrients but no soil. This provides flexibility in where a plant is grown, and takes away some of the limitations of growing plants such as land, greenhouses, large amounts of space, etc. The AeroGarden® is a deep water culture hydroponic system. In this system, the plant's roots are always in a deep tank of water and nutrient solution. This provides flexibility in growth location, stability in nutrients, and low maintenance making this system a good choice for classrooms. For this lesson, students will be able to observe soybean growth through all stages, right from their classroom! Students will also drive this lesson by utilizing the scientific method to design an experiment using the AeroGarden® and the soybeans.

Important Vocabulary:

Scientific Method: a series of steps that are used to investigate a natural occurrence

Hypothesis: an educated guess about the relationship between your independent and dependent variables

Independent Variable: The factor that is intentionally manipulated by the experimenter

Dependent Variable: The factor that may change as a result of changes to the independent variable

Constants/Controlled Variables: factors that the experimenter intentionally keeps the same so that any changes can be attributed to the independent variable.

Deep Water Culture: a hydroponic system where a plant's roots are suspended in a solution of water and other nutrients

Hydroponics: the process of growing plants in sand, gravel, or liquid, with added nutrients but without soil.

Materials:

- AeroGarden® Harvest of Harvest Slim Kit - 1 (or more) per class
- Hoyt Soybean Seeds
- Science Journal/Scratch Paper
- Pen/Pencil
- Scientific Method Slides
- Experimental Design Plan
- Hydroponics/AeroGarden® Research Sheet (optional)

Bioenergy: *From Field to Fuel*

Lesson Day One:

1. Show students your AeroGarden®. Let them ask questions about what it is, but do not provide detailed answers.

2. Have students get out their science journal, scratch paper, or the provided Hydroponics/AeroGarden® research sheet. They will also need an electronic device to conduct research with.
    a. Students should research hydroponics and its importance, methods of hydroponic plant growth, and then focus on deep water culture (which is the hydroponic system an AeroGarden® uses).

3. Introduce and/or review the scientific method with students. You may utilize the Scientific Method Slides to help you.
    a. Ask students, "how do we answer questions?" Allow all appropriate responses.
    b. Tell students that the scientific method is a process that we can use to answer questions. Then review the six steps:
        i. Make an Observation and Ask a Question
        ii. Conduct Research
        iii. Construct a Hypothesis
        iv. Test Your Hypothesis
        v. Analyze and Draw Conclusions
        vi. Communicate Your Results

4. Tell students that they will be working with a group to design an experiment using the AeroGarden® and soybean seeds when they return.

Lesson Day Two:

1. As a review, ask students why the scientific method is important.
    a. Answers should be thing such as: it allows us to answer questions, it ensures accurate results in experiments, etc.
    b. As students are reviewing, you may ensure that they remember the growth stages of a soybean from the Lego Life Stages lesson, or these slides: Soybean Growth

2. Put students in groups of 3-4 and have them work together to design an experiment utilizing the AeroGarden® and the soybean seeds.
    a. Each group should complete an Experimental Design Plan.
    b. Tell them that they have made observations and completed research already, which are part of the scientific method. Allow them to use a device for additional research if needed.

3. Walk around the room monitoring the plans of each group and guide them to follow the scientific method, if necessary.

Lesson Day Two:

4. Once all designs are complete, have groups share a brief outline of their plan with the class.

5. Allow the class to vote on the experiment (or more than one depending on your number of AeroGarden®s) that they would like to complete as a class.
    a. Examples of possible experiments are:
        i. Comparing the growth of two (or more) soybean varieties
        ii. Different light heights at germination
        iii. Hydroponic growth vs. traditional soil growth of soybeans

Lesson Day Three and Beyond:

1. Setup the experiment as a class. Go through the scientific method as a class and ensure that every piece was accounted for in your experimental design (with the exception of analyzing data and communicating results).

2. Over the course of the experiment, students should collect data in a science journal (could just be scrap paper) utilizing the plan and timing outlined in the experimental design sheet.

3. Once the experiment is completed, have students analyze the data and write their conclusions in their science journal.

4. To communicate their results, have students write a short scientific journal article. You may show them examples to assist.

Information Sources:

Haggard, B. (2022, July). *Introducing AeroGardens Into Your Programs*. Lecture, Stillwater, Oklahoma; Stillwater, Oklahoma.

Espiritu, K. (2021, May 18). *Deep water culture (DWC): What is it and how to get started*. Epic Gardening. Retrieved July 17, 2022, from https://www.epicgardening.com/deep-water-culture-get-started/

Image Sources:

Soybean Emergence: Image by Julio César García from Pixabay

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