Soybeans

*Lesson Plan for Grade 2, Science*

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*Modified by Mississippi State University, School of Human Science*

*for Mississippi Farm Bureau Federation - AITC*

# OVERVIEW & PURPOSE

Students will observe how plants respond to gravity by germinating soybeans in a CD case and rotating the case as they grow.

# EDUCATIONAL STANDARDS

**Mississippi College-and-Career Readiness Standards:**

L.2.3A Students will demonstrate an understanding of the interdependence of living things and the environment in which they live.

Math-2.MD.8b Fluently use a calendar to answer simple real world problems such as “How many weeks are in a year?” or “James gets a $5 allowance every 2 months, how much money will he have at the end of each year?”

**NALOs:**

T2.K-2 a Explain how farmers/ranchers work with the lifecycle of plants and animals to harvest a crop.

# OBJECTIVES

* Students will observe the growth of soybeans in a unique environment

# MATERIALS NEEDED

* Paper towels (1 per student)
* [Topsy-Turvy Observation Worksheet](https://naitc-api.usu.edu/media/uploads/2015/01/26/Topsy-turvy_Observation_Chart.pdf) (1 per student)
* Permanent markers (1 per group or student)
* Large binder clips (2 per group)
* Water ( classroom supply to water plants)
* 4 soybeans for each student or team of students. (Soybean seeds can be obtained from some local stores in their gardening and seed section or through an online seed distributor)
* 1 clear plastic CD case for each student or team of students (must be the thick CD case, not the newer thin style)

### Essential Files (maps, charts, pictures, or documents)

* [Topsy-Turvy Observation Worksheet](https://drive.google.com/file/d/15BAGk6QfYxrMNprCyJNmeBd05HFr6m5W/view?usp=drive_link)

# Lesson Set Up:

1. Have the paper towels, CD cases, water, and soybeans ready to use.
2. Have a marker and a binder clip to label and attach to the CD case.
3. Print the [Topsy-Turvy Observation Worksheet (1 per student).](https://drive.google.com/file/d/15BAGk6QfYxrMNprCyJNmeBd05HFr6m5W/view?usp=drive_link)

# VOCABULARY

**geotropism:** growth of a plant in response to the force of gravity

**germination:** process of a plant emerging from a seed and beginning to grow

**hilum:** the point where the seed attaches to the pod; usually a slight reddish color and elliptical in shape

**statocytes:** cells that surround the rootlet tips

# Ag Facts:

* The soybean or bean is a species of legume native to East Asia, widely grown for its edible bean which has numerous uses.
* Soybeans are used to feed livestock, make biodiesel, and processed into many food and household products.
* Iowa and Illinois are the top soybean producing states in the country.

# Background information for teachers:

Did you know that plants are able to sense their environment and actually respond appropriately? One of the key parameters that every plant must respond to is the direction of gravity: stems go up (opposite to the pull of gravity) and roots go down (in the same direction as the force of gravity).

By sensing gravity, plants can turn sideways, upside down, etc. Scientists first theorized that the plant could tell by the warmth of the soil, but now we know that they sense gravity and automatically know where down is and grow upwards. This is a crucial skill for the plant because they need to grow upwards and get their leaves out of the soil so they can reach the sunlight and grow. Even though it seems easy to understand that plants sense gravity, the actual mechanisms inside the plant roots are quite complicated. **Statocytes** are a kind of cell that surrounds the rootlet tips. Inside statocytes, the statoliths act as a motion sensor. Movements of these small bodies allow the roots to understand the direction of gravity.

# LEARNING PROCEDURES

Interest Approach:

1. Ask students to close their eyes and bend over. Do they know which way is up and which way is down? How can you tell?
2. Ask students how gravity affects the way we perceive the world? Are other organisms affected by gravity?
3. Discuss the question, "If you plant a seed upside-down will the roots grow up?" Inform your students that they will be performing an experiment to answer this question.

### Procedures

1. Cut the paper towel or blotting paper so it fits inside the CD case.
2. Moisten the paper towel and lay it in the case.
3. Evenly place four soybeans on the paper towel. Orient the soybeans in at least two different directions (note the direction of bean’s hilum).
4. Close the CD case so that the beans are held snugly. Tape the case shut.
5. Using a marker, number the soybeans 1,2,3,4 on the outside of the case.
6. Set the CD case in an upright position. Attach a binder clip to the bottom to help keep the case upright.
7. Keep the paper towel moist. As the seeds begin to sprout, note the direction in which the roots and stems are growing. Does the direction the seed is turned affect the direction of growth?
8. Two days after the seeds have begun to grow, rotate the CD case 90° on its side. Continue rotating the case every two days. Did rotating the case affect the growth?



**Concept Elaboration and Evaluation**

After conducting these activities, review and summarize the following key concepts:

* Plants can sense gravity allowing the roots to grow down and the stem to grow up.
* Plants rely on the sun, soil, and water for healthy growth.

# Additional Learning Procedures

To help students review and elaborate more about soybeans try using the [“Carousel”](https://drive.google.com/file/d/1J2JjNcFshuuq_g2S9IWp85LkMTUYZAg1/view?usp=drive_link) method to allow students to think deeper and make new connections.

Additional texts to include:

[My Family’s Soybean Farm](https://www.agfoundation.org/recommended-pubs/my-familys-soybean-farm)

[Soybeans](https://www.agfoundation.org/recommended-pubs/soybeans-an-a-to-z-book)

[The Super Soybean](https://www.agfoundation.org/recommended-pubs/the-super-soybean)

[Aunty Yang;s Great Soybean Picnic](https://www.agfoundation.org/recommended-pubs/auntie-yangs-great-soybean-picnic)



Source: https://www.agclassroom.org/teacher/matrix/

*For more information and additional lessons visit*

*https://msfb.org/ag-in-the-classroom/lesson-plans/.*