Earth Day STEM-based Hands-on Instruction Plan & Time-line

Objectives: Learn what seeds need to germinate
Learn the growing requirements of Sage
Grow Sage from seed to harvest
Measure & analyze Sage production in a sub-irrigated system (SIP)
Increase Science Literacy (new vocabulary is highlighted in yellow)
Prepare and serve healthy *Sage and Parmesan Cheese Biscuits*

Materials: Sage seeds
Six 12-Pellet Seed Starter Trays
An EarthBox Container Garden System

Time: 45 minutes per activity

Early February

PLANT 24 Sage seeds in each of (six) 12-peat pellet seed starter trays (2 seeds per pellet to make sure at least one germinates). Place the trays under six different growing conditions to compare and analyze germination results:

1. warm, dark area; keep moist
2. warm, dark area; don't moisten
3. warm, sunlit area; keep moist
4. warm, sunlit area; don't moisten
5. cold, dark area; keep moist
6. cold dark area; don't moisten

Guided Inquiry & Prediction: What conditions will produce germinated seeds?
Observation: Observe the seeds on a daily basis. Record your observations.
Analysis: Which seeds germinated? When and why?
Conclusion: What conditions do seeds need to germinate?

Harden off the tray of 12 healthy seedlings in a sunny, protected area for 2-3 hours per day. Bring the tray indoors for the remainder of the day. After 2-3 days of hardening, keep the seedlings outdoors in the sunny protected area all day and night. Continue to keep them moist until they are 3 inches tall and ready to transplant (about 3 weeks).
Why is it important to put the seedlings in sunlight?

Mid-February

SET UP an EarthBox® System following the instructions shipped with the kit. Observe how the components work together as a system. Follow the Plant and Placement Chart for two- row planting. Do not follow the instructions to cut holes for the seedlings. You will be instructed how to do this later.

Guided Inquiry & Prediction: Will the EarthBox System provide the conditions Sage needs to grow?
Observation: Read how the components create a unique and controlled environment
Analysis: Use technology to learn the conditions the herb , Sage, requires to grow: http://www.wikihow.com/Grow-Sage . Compare the conditions Sage needs to grow with the conditions provided by the EarthBox System
Conclusion: Does the EarthBox System's controlled environment provide the conditions Sage needs to grow?

Mid March

TRANSPLANT Cut six equidistant one inch "X" shaped cut-outs in the mulch cover along two long sides of the EarthBox. Press your fingers through the holes to create pellet sized spaces in the potting mix. Transplant 12 healthy pelletized seedlings into the holes. Place the system outdoors in full sun for the remainder of the growing season. Assign students to keep the reservoir full throughout the growing season.

Guided Inquiry and Prediction: Will the EarthBox System produce a high yield of Sage?

Observation: Label each seedling. Count and record the number of leaves on each. Measure and record the height of each seedling.

Analysis: What is the average number of leaves on the seedlings? What is the highest number of leaves on any one seedling? the least?

April 22, Earth Day

HARVEST:

Observation: Count the leaves on all 12 seedlings.

Analysis: Did you predict the number accurately? Was the growth from seed to transplant proportional to the growth from the transplant to the harvest? Is this a good yield?

Increase Science Literacy with lesson-related vocabulary

Germination - the process by which a plant grows from a seed

Sage - Any of various plants of the genus *Salvia,* having aromatic grayish-green, opposite leaves.

SIP - Any method of watering plants where the water is introduced from the bottom, allowing the water to soak upwards to the plant through capillary action

Peat Pellet- A small, solid or densely packed ball of peat

Harden off - The process of moving plants outdoors for a portion of the day to gradually introduce them to the direct sunlight, dry air, and cold nights.

Seedling - a young plant developing from a seed starting with the germination of the seed.

Controlled Environment - a standard of comparison to check or verify the results of an experiment.

Herb - Any seed-bearing plant that does not have a woody stem and dies down to the ground after flowering.

Seed-bearing plant - The seed-bearing plants have been an enormously successful group in the history of life, owing to the evolution of seeds and pollen. The seed is a superior unit of dispersal to the naked spore, since it includes a food reserve and, among angiosperms, a protective layer. Also, seedless plants are dependent upon the presence of liquid water for sperm dispersal. Pollen makes water unnecessary for sperm transport. Instead, eggs are fertilized after male nuclei have been transported within the protective pollen grain to the female reproductive parts, usually by pollinating agents such as insects or wind. The gymnosperms and the angiosperms together form the seed-bearing plants.

Gymnosperms - the seeds are not enclosed within fruit

Angiosperms - seeds are enclosed within fruit

Spores- is an unprotected reproductive cell produced by certain fungi, plants (moss, ferns), and some bacteria

Genus – A category of biological classification

Capillary action - The ability of a liquid to flow in narrow spaces without the assistance of, and in opposition to, external

Transplant - To move or transfer (something) to another place or situation, typically with some effort or upheaval.

Proportional - When two quantities always have the same relative size. Having the same ratio, the quantitative relation between two amounts showing the number of times one value contains or is contained within the other

PREPARE AND COOK BISCUITS: http://www.wikihow.com/Make-Parmesan-and-Sage-Biscuits

Order the EarthBox Youth Garden Guide and/or World Food Day Garden Kit to develop programs that meet your individual needs!