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EarthBox® for Earth Day Instructional Plan

Focus: Sustainable Agriculture, data collection & healthy eating……one box and one classroom at a time!

Time Required: 45 minutes

Time until harvest: 50-55 days
30-35 days for tender baby leaves

Objectives:
- Understand the science behind an EarthBox System
- Learn the sustainable characteristics of the EarthBox system
- Grow out an EarthBox with lettuce
- Collect and record data to make a prediction
- Harvest, wash, and prepare a healthy snack

Materials Required:

1 Ready to Grow Kit Item #1010065
1 pack of romaine lettuce seeds Item #1010775
1 Scissors and 1 Scale
A sample head of grown out Romaine Lettuce
One paper plate

Included Hand outs:
1. The Science behind the EarthBox Explanation Sheet
2. The Science behind the EarthBox Worksheet
3. Prediction Form
4. Data Collection Form


Garden Stand Sold Separately

Teacher Preparation: Open the Ready to Grow Kit. Read the Instruction Manual. Then, read the hand out, "*The Science behind the EarthBox Explanation Sheet".* Review each step in the lesson to prepare to teach. Make copies of the 4 handouts for all students and gather all the materials.

Procedures:

Step 1: Hand out copies of "*The Science Behind the EarthBox® Explanation Sheet"*. Each word typed in **bold** identifies one of the 8 components of the EarthBox system.

Step 2: Lay out all 8 components of the system (the EarthBox® container, the screen, watering tube, cover, potting mix, dolomite, fertilizer and casters). Select 8 students to demonstrate the 8 components. Hand a component to each student and tell them its name. Ask them to hold up their component when they hear it described by another student reader.

Step 3: Select 7 students to read the 7 numbered sections of *"The Science Behind the EarthBox® Explanation Sheet"* aloud. Tell them to pause when they reach a word typed in **bold** to give the demonstrators an opportunity to show the component to the class.

Step 4: Ask demonstrators to come to the front of the room and the readers to stand in place at their desks to begin.

Step 5: After the reading, ask all of the students to complete "*Understanding the Science Behind the EarthBox® Worksheet"*. Collect all the components while the class completes the worksheet.

Step 6: Lead a discussion about the effect of the EarthBox design on resource use and yield.

Step 7: Follow the instructions to plant the Ready to Grow Kit with the lettuce seeds. Place it outdoors in the sun as directed on the seed packet. Assign a student to keep the reservoir full until the harvest.

Guided Inquiry: Demonstrate a head of Romaine Lettuce. Weigh it. Ask the students to predict how many grams of lettuce an EarthBox Ready to Grow Kit will produce? Pass the Prediction Form around the room for the students to sign and predict. Keep the predictions to evaluate them against the actual harvest.

Harvest Date Activity

Step 1: Take the students outdoors, or bring the EarthBox indoors for the harvest. In either case, be sure to empty the reservoir through the drain hole. Make sure the drain hole is tipped away from you when pouring unless you want to be standing in a puddle! Ask 8 different students to use a scissors to harvest one head of lettuce at a time.

Tell them to cut the lettuce at the baseline between the lettuce and the mulch cover.

Step 2: Select a group of 8 students to weigh a head of the lettuce. Assign a scribe to record the weight of each head of lettuce on the data form.

Step 3: Ask the scribe to calculate and announce the combined weight of he lettuce heads.

Step 4: Discuss the actual yield against the students' predictions.

Step 5: Place 100 grams of lettuce on a plate. Tell the students that 100 grams provides the minimum daily requirement of Vitamin A.

Step 6: Ask the students to calculate the number of servings the Earthbox system produced if 100 grams = 1 serving.

Extension: Take the lettuce home to clean. Bring it and small paper plates back to class along with any other ingredients you want to include to provide a fresh salad for each student. Assign two students to weigh out and serve 100 grams for each student in the class and add the extra ingredients. A comer!

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Student Prediction Form

How many grams of lettuce will an EarthBox produce?

Student Name	Prediction of # of Grams

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The Science behind the EarthBox® Explanation Sheet

Section 1

The EarthBox® is a unique eco-friendly, container garden system. It allows the user to grow a multitude of vegetables, flowers and herbs without having a traditional garden, or garden site. Each component has a designated purpose(s). The **EarthBox container** is the central piece. It houses the plants and the other components. **The aeration screen,** located near the bottom of the EarthBox®, serves two very important functions. It holds the potting mix above the water reservoir, between the screen and the overflow hole, to make air available for the roots. It also prevents the potting mix from falling into the reservoir except beneath the two large, square cut outs in the corners where it becomes the conduit of water distribution through capillary action.

Section 2

Plants in EarthBox® Container Garden Systems get their water from a bottom reservoir that is fed through a 12 inch **watering tube** secured inside a circular hole in the aeration screen at the bottom and slipped through a hole in the mulch cover on the top. A recessed overflow hole**,** located ½ inch below the aeration screen in the front of the box, drains excess water to secure the space reserved for air and to eliminate the possibility of overwatering.

Section 3

To maximize the effectiveness of capillary action, the **potting mix** used in an EarthBox® should be light and airy. Only then will cohesion, the force that holds individual water molecules together, and adhesion, the force that makes water molecules stick to other surfaces, evenly distribute water to the roots of the plants. Capillary action begins in the system when water adheres to small particles of the potting mix that lie beneath the cut out squares in the aeration screen. As water molecules stick together and enter the potting mix, they also adhere to the particles of potting mix. Together, the two properties of adhesion and cohesion draw a flow of water from the reservoir into the mix until all of the potting mix is wet. The roots draw the water as they need it through capillary action. As the roots absorb water, more is pulled up from the reservoir. When the reservoir is kept full, the plants will always have the proper amount of water, never too little, nor too much.

Section 4

Plants need nutrients to grow. Since the potting mix used in the EarthBox is sterile, the system requires a single, seasonal, application of nutrient-rich **fertilizer** for the plants to grow**.** Therefore**,** at the beginning of each season, the fertilizer strip is placed on top of the potting mix. Throughout the season, capillary

action ensures the regular flow of water over the fertilizer. Using the gradient system, the fertilizer diffuses from a higher concentration to a lower concentration. During this process, the roots uptake the nutrients as they become available, and more importantly, when they need them.

Most edible crops prefer a sweet growing medium with a neutral pH of 7. Since the natural 5.5 pH of the peat-based potting medium is 5.5, dolomite is added to raise the pH to 6.5-7. The dolomite also provides an extra source of calcium for fruit development and provides other trace minerals plants need to grow.

Section 5

The **plastic mulch cover** is another important element of the EarthBox® system. It serves several critical functions that control the EarthBox® environment. The cover:

- keeps rain out of the EarthBox®. If rain were to fall on the potting mix, it might

deliver too much fertilizer to the plants, or give the plants more water than needed.

- reduces evaporation. The cover prevents the release of water into the air and returns it to the system through condensation. This can be critical to plant life in certain environments.
- helps to keep insects and other pests out of the potting mix.
- prevents weeds from growing in the EarthBox®.
- conserves energy. By reducing the amount of water a crop needs, it reduces the amount of energy used to transport the lesser amount.
- makes the EarthBox an ideal tool for conducting experiments.

Section 6

While the EarthBox® is capable of growing virtually any type of plant, the number of each type of plant that can be successfully grown in it, differs. The number of plants is determined by the overall size of the plants, their nutritional needs, and the size of the root balls. For example, after extensive research, scientists determined that two tomato plants, produce the highest yield and the healthiest plant.

No matter the weight of a planted EarthBox Ready to Grow Kit, the **casters** make it easy to move it in and out of a classroom, or in and out of sunlight. They also make it easy to remove a diseased or infested container to prevent further infestation or disease.

Section 7

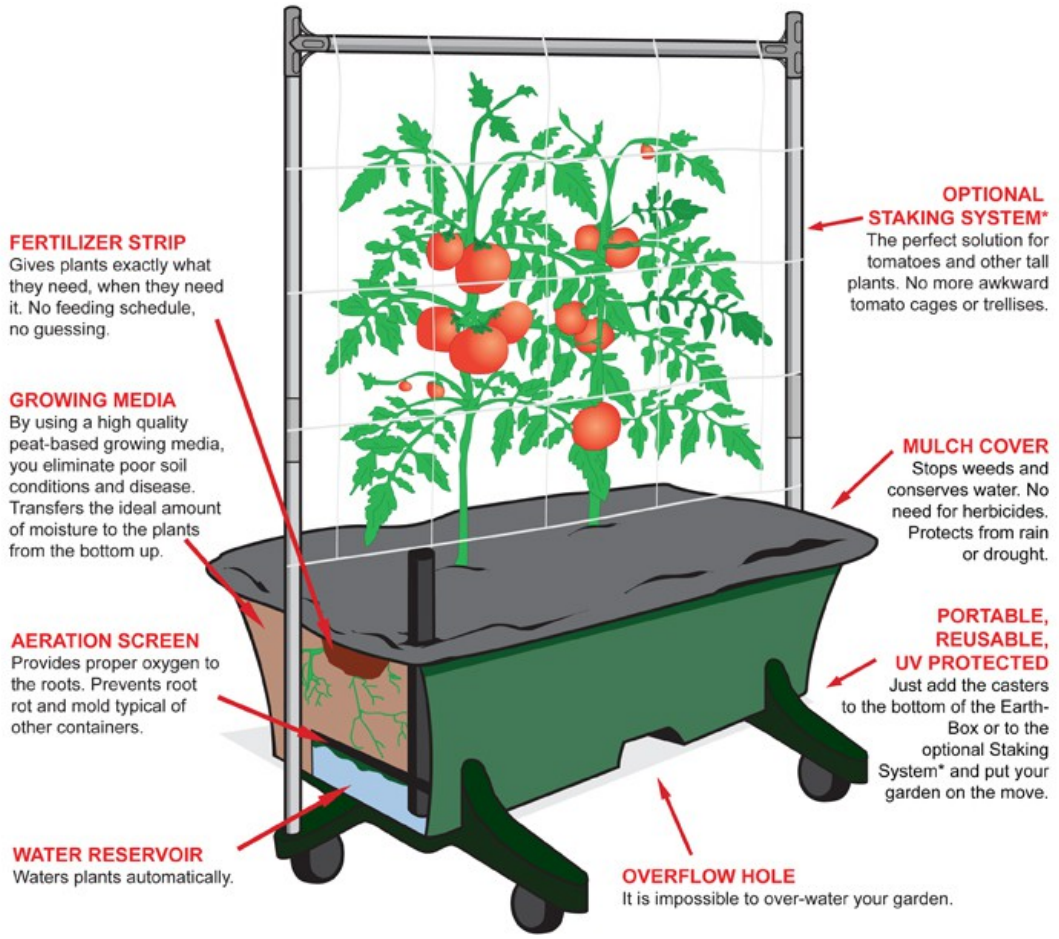
EarthBox technology produces sustainable results:

- The EarthBox® itself is UV protected, reusable and recyclable.
- The potting mix is re-useable for 8-9 seasons.
- Calculated, seasonal applications reduce fertilizer requirements.

- The mulch cover prevents runoff and ground water pollution
- The system reduces the amount of water needed.
- The reduced amount of water conserves energy.
- EarthBox® enhances local food security because healthy crops produce high yields on balconies, decks, rooftops and backyards, on pavement and concrete, anywhere there is 6-8 hours of light.
- Growing locally reduces
  - food fuel dollars associated with transportation
  - the likelihood of importing pests and diseases
  - the damaging effects to the environment associated with Ag for Export:
  - erosion and climate change

"Food and shelter are integral to good health and survival…Integrating sustainable food production using the EarthBox Container Garden System into green building design reduces our carbon footprint and increases the availability, accessibility and affordability of healthy produce which leads to an overall healthier community and environment".

Michelle Kaufmann, AIA, LEED®, AP



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The Science behind the EarthBox® Worksheet

1. Draw an EarthBox® to illustrate the flow of water within the container:

2. Give two reasons why the overflow hole is important to the science of the EarthBox®:

   _____

   _____

3. Name and explain the system that provides the plants with nutrients:

   _____

   _____

   _____

4. What significant plant growth requirements does the EarthBox® meet?

   _____

   _____

5. Name three sustainable characteristics of the EarthBox®:

   _____ _____

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_____

The EarthBox® Harvest Data Form

HYPOTHESIS: *How much lettuce will one Ready to Grow Kit produce?*

Total Harvest in grams Table (g)

Plant #1	Plant #2	Plant #3	Plant #4	Plant #5	Plant #6	Plant #7	Plant #8
g	g	g	g	g	g	g	g

Total Harvest Weight

_____ *grams*