



Explore, Inquire, Discover

Activity: How Does the EarthBox Design Affect Resource Use and Yield?

Focus: Horticulture

Time Required: 45 minutes

Goal:

- ³⁵/₁₇ Understand the scientific design of the EarthBox® system
- ³⁵/₁₇ Learn how the design nurtures plants
- ³⁵/₁₇ Learn the sustainable characteristics

Materials:

- ³⁵/₁₇ “*The Science Behind the EarthBox® Explanation Sheet*”
- ³⁵/₁₇ Diagram of the EarthBox & its Components
 - “*Understanding the Science Behind the EarthBox® Worksheet*”
- ³⁵/₁₇ EarthBox® Ready-to-Grow Kit (includes the EarthBox®, aeration screen, fill tube, fitted plastic covers, potting mix, fertilizer, dolomite, casters)
- ³⁵/₁₇ Student Binders

Handout(s): Yes. The lesson requires copies be made from the materials list.

Preparation: Read “*The Science Behind the EarthBox® Explanation Sheet*” to learn the names of the EarthBox® components & how the system works. Bring copies of the “*Science Behind the EarthBox Explanation Sheet*”, the EarthBox Diagram, and the “*Understanding the Science Behind the EarthBox Worksheet*” for each student, one Ready to Grow Kit, and the student binders.

Student Orientation: How does the EarthBox design affect resource use and yield? Students will learn the parts of the EarthBox and its set up to see how its scientific design effects resource usage and yield.

Step 1: Hand out the binders and “*The Science Behind the EarthBox® Explanation Sheet*”. Explain how students will hold up the parts of the EarthBox system while other students read the explanation of how the 8 parts work together to create a system.

Step 2: Show and name the 8 parts of the EarthBox® system (the EarthBox® container, the screen, watering tube, cover, potting mix, dolomite, fertilizer and casters). Select and assign 8 students to display the 8 parts during the upcoming reading.

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 allow everyone to view the demonstrated part, learn its name, and function.

Step 4: Ask the readers and those demonstrating the parts to come to the front of the room to begin to read and demonstrate. Have the students walk the room to for all to see, and touch each part after the reading is over.

Step 5: Have the students complete the “*Understanding the Science Behind the EarthBox® Worksheet*”. Discuss and assess student comprehension of the effect of the EarthBox design on resource use and yield. Collect all parts and the binders.

Topical Quote! “The American lawn uses more resources than any other agricultural industry in the world. It uses more phosphates than India and puts on more poisons than any other form of agriculture.”

– *Bill Mollison is a researcher, author, scientist, teacher and naturalist. 1928-*

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 and the overflow hole to make air available to the roots. It also prevents most of the potting mix from falling into the reservoir except beneath the two large, square cut outs.

Section 2

Water is poured into a 12 inch **watering tube** that is placed through a circular hole in the aeration screen. Once it is securely placed, it extends two inches above the top of the container for easy access. The other end rests in the bottom of the reservoir.

Section 3

Water is distributed throughout the system by the potting mix that falls through the cutout squares in the screen. The fallen potting mix uses the properties of capillary action, cohesion and adhesion, to wick water up and through the system. Cohesion is a force that holds individual water molecules together. Adhesion is the force that makes water molecules stick to other surfaces. The light and airy **potting mix** used in an EarthBox® facilitates capillary action. When the reservoir is kept full, the plants will always have the proper amount of water, never too little, nor too much. A recessed overflow hole drains off any excess water.

Section 4

Plants need nutrients to make food. A single, seasonal, application of nutrient-rich **fertilizer** placed on top of the potting mix provides all the nutrients the plants need. 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



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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

A Diagram of the EarthBox® and its Components

Seedlings/Starters
Up to 16 seedlings, starters or seeds
can be planted in the EarthBox



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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®:
