

PHENOMENON-BASED INSTRUCTIONAL TASK | GRADE LEVEL: 3<sup>rd</sup> Grade

# THE ENVIRONMENT CHANGED ME!

**TARGETED DCI AND/OR ASSOCIATED PE****PE | 3-LS3-2**

[Use evidence to support the explanation](#) that **traits can be influenced by the environment**.

**DCI |**

**INHERITANCE OF TRAITS:** Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.

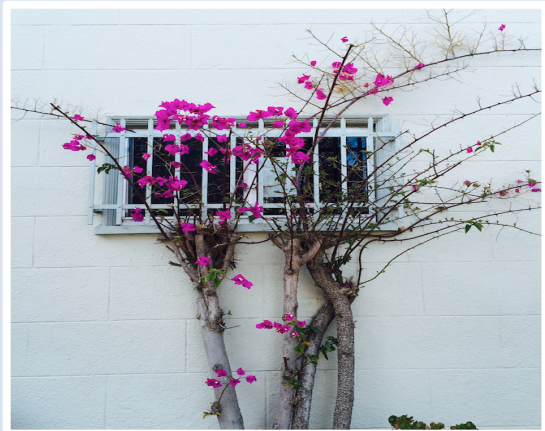
**VARIATION OF TRAITS:** The environment also affects the traits that an organism develops.

**POSSIBLE DRIVING PHENOMENA****Student observation or initial interaction:**

Students observe a giant pumpkin that weighs so much it has to be picked up by a tractor and a watermelon that is square.

**Student observation or initial interaction:**

Students observe a tree that is bent over and touching the ground and a tree whose leaves have turned brown or fallen off in the summer instead of the fall.



### Phenomenon explanation for teachers:

Giant pumpkins generally weigh more than a thousand pounds. The increasing size of giant pumpkins over time is partially due to genetic changes in seeds, brought on by selective breeding. Other factors in the environment that can play a role in growing giant pumpkins are fertilizer, soil conditions, water, and the removal of all but one blossom from the pumpkin plant so all of the energy goes into a single pumpkin. A pumpkin is roughly 90 percent water, and the rest is sugar and starch. While all pumpkins easily move large amounts of water, giant pumpkins move sugar around more efficiently than regular pumpkins. Plants have two types of transport tissue. Xylem transports water and phloem transports sugar. Giant pumpkins have super-sized phloem, allowing them to grow to larger sizes due to the efficient transport of food (sugar).

A square watermelon is actually easy to grow. While the watermelon is still small on the vine, a square, tempered glass box is placed around it. When the watermelon gets bigger, it assumes the shape of the box. This type of watermelon was developed in Japan to accommodate smaller refrigerators and facilitate ease of stacking for shipment.

### Phenomenon explanation for teachers:

In the first image, strong winds are causing the tree to sway and touch the ground. When plants and trees grow in the wild, the wind constantly keeps them moving, which causes a strain in the wooden load-bearing structure of the tree. To compensate, the tree manages to grow a tissue called reaction wood (or stress wood). Stress wood usually has a different structure (in terms of cellulose or lignin content). The wind damages parts of trees that remain upright in strong winds, so the tree's response to the wind causes a change in shape. This is how trees are able to twist toward the best light and still survive distress even when they have taken on awkward shapes. Sometimes these winds can be so strong that they cause the tree's roots to be pulled and stretched, which can disrupt the tree's root-soil contact and cause the tree to have less ability to absorb water.

In the second image, a drought environment has affected the tree, causing it to lose its leaves even though it continues to flower. Trees lose water through foliage and, to reduce stress, plants will sometimes drop their leaves. The tree also begins to flower heavily, which allows it to have a better chance of producing the next generation of trees.

### HOW DOES THE PHENOMENON CONNECT TO THE DCI OR PE?

Organisms (both plants and animals) have different life cycles, but all life cycles have commonalities. Traits are inherited from the parents of the organism, but these traits can vary within similar organism groups. The organism's environment can influence some traits. Students can **make observations** that **all living things have a beginning** (plants sprout), **grow**, **develop into adults**, **reproduce**, and **eventually die**. Students should see **patterns** in the **traits of different organisms**. Many plants have similar traits within species or groups (e.g. plants have leaves and stems). Students will **observe evidence** that **plants inherit traits from their parents and that these traits can vary in groups**. For example, pumpkins inherit a round shape, but not all pumpkins are the exact same shape and size. Trees have leaves, but each species of tree has a different kind of leaf. Students should be **able to explain** that **the environment influences some of the varying traits in organisms**. Many trees, with the help of light-sensing proteins, find the shortest route to the sunlight and are able to bend in the direction of the light source. Watermelons can be square when humans manipulate them, and pumpkins can be huge when started from selected seeds. Students can **construct explanations about** how **plants have adapted to their environments, which can change how the plants look or behave**.

### GATHERING AND REASONING IN ORDER TO CONSTRUCT AND REFINE EXPLANATIONS:

*How could students gather evidence using SEPs and CCCs that will help them construct/refine a supported explanation of the phenomenon?*

#### 1. INITIAL ENGAGEMENT WITH THE PHENOMENON:

- Students observe the phenomena pictures. Students can use what they know about properties and their five senses to identify and list observations of the different plants.

#### GUIDING QUESTIONS:

- What patterns do you see about growth in these phenomena (pumpkins, watermelons, trees, or other plants)?
- Do giant pumpkins come from the same seeds as regular pumpkins? What things could make the pumpkins grow so big?

- Students can formulate descriptive questions about the pictures that will lead to further investigation.

**Focus questions:** *Why do some organisms look the same as their parents and others do not? How can the environment influence an organism's traits?*

## 2. CONTINUING EXPLORATION:

- Students and the teacher can identify questions to be researched and investigated. Students can identify ways to collect the data and information needed to answer the questions. (using books, investigations, articles, the internet, etc.)
- Students can grow pumpkin or watermelon seeds of different varieties and observe similarities and differences in the leaves, flowers, and fruit. *(If growing plants is not an option, pictures of these plants could be used.)*
- Students can create a model to explain and communicate that the life cycle of a plant begins with a seed, followed by the growth of a plant, and then the production of more seeds.
- Students can gather information to provide evidence about the role the environment plays in changing organism traits. Students can use reasoning to connect the evidence and support explanations about environmental influences on inherited traits in organisms.

- Why do some organisms look the same as their parents and others do not?
- What do you predict would happen if you planted a variety of pumpkin, watermelon, or tree seeds under different conditions? What might cause them to grow differently?
- What kinds of characteristics do organisms inherit from their parents? What kinds of characteristics can be influenced by the environment of the organism?
- In what ways can organisms of the same species look different from one another?
- How do plants survive in their environment?
- How can the environment influence an organism's traits?
- Why do plants need to adapt to their environment?
- What kind of plant characteristics might be affected by the environment?
- What characteristics might be affected by both inheritance and the environment?
- In what ways can the environment affect an organism's characteristics?

## COMMUNICATE FINAL EXPLANATION OF THE PHENOMENON:

*How might students communicate their understanding of the targeted DCI or PE in an explanation supported by evidence?*

### Possible formats for constructing explanations of this phenomenon.

- Students can construct a statement in which their chain of reasoning, shows a cause and effect relationship between a specific contributing environmental factor and a trait variation (e.g., regular strong winds causing a tree to grow sideways).
- Students can create an anchor T-chart to compare inherited traits and environmentally acquired traits in these phenomena.