Grade Level: First

Piagetian Level: Early Concrete

Learners with emerged & developing concrete operations are suitable for this assignment.

STEM *Science, Technology, Engineering, & Mathematics*

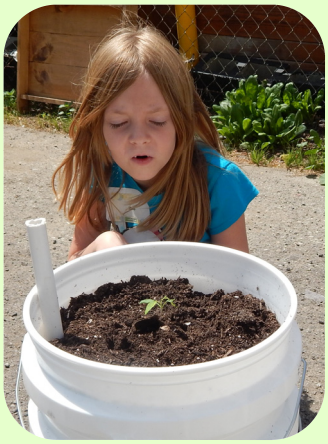
Learn & Grow Educational Series℠

Not Exactly Alike

Instructional Goal: Following instruction, students will demonstrate the understanding that the offspring of fruit-bearing plants are similar, but not identical to, their parent fruits.

Lines of Inquiry:

- *How ae the fruits produced by plants grown from seeds taken from a grown fruit similar to their parent fruit?*
- *How are the fruits produced by plants grown from seeds taken from a grown fruit different from their parent fruit?*



Materials:

- One whole, organic, fresh bell pepper & one whole, organic, fresh banana

pepper for demonstration purposes, plus one each whole, organic fresh bell pepper and banana pepper per group of 3-4 students

*IMPORTANT NOTE: Do **not** substitute any hot peppers for the bell or banana peppers as students could accidentally get the juices in their eyes, noses, and/or mouths, causing chemical burning.*

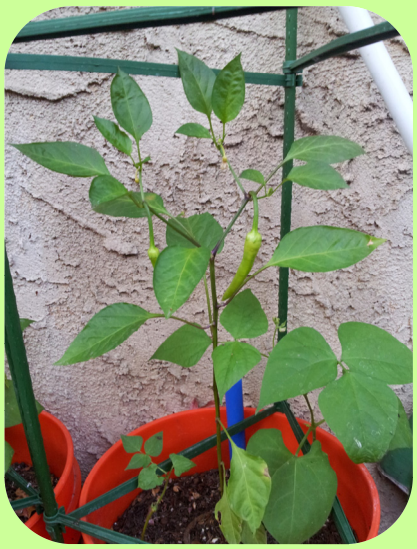
- Digital camera
- Paper towels
- Pens or markers (one for yourself and enough for each group to have one)
- 4 seedling starter pellets per student
- 4 small disposable cups per student
- 4 plastic sandwich bags per student

Common Core Standards:

- W.1.7. Participate in shared research and writing projects.
- W.1.8. With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
- MP.2. Reason abstractly and quantitatively.
- MP.5. Use appropriate tools strategically.
- 1.MD.A.1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.

CA State Standards—Science:

- 1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly the same, as their parents.



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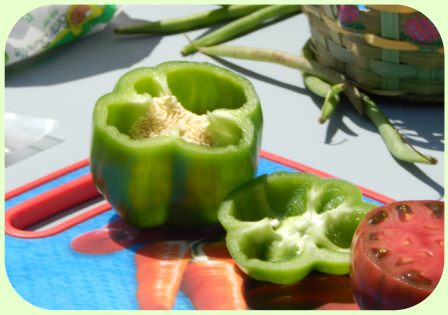
Not Exactly Alike, continued…

- 4 small to medium-sized peat pots per student
- An area that is properly lit and warm for starting seedlings (a warm, sunny windowsill or artificially lit indoor countertop, for example)
- Materials and tools for one self-watering container per student (see http://learn-and-grow.org for instructions and materials list)
- Organic potting soil mixed with organic fertilizer or compost
- Gardening flags or popsicle sticks for labeling plants in self-watering containers



Instructions:

- As part of whole-class instruction, cut open a bell pepper and show students the seeds; explain that peppers are actually fruits, not vegetables, because they come from flowers and contain seeds.
- Explain that vegetables are leaves, stems, and roots; for example, lettuce and spinach are leaf vegetables, asparagus and celery are stem vegetables, and carrots and onions are root vegetables.
- Scrape out the seeds and place them on a paper towel; label the paper towel with a pen or marker, "bell pepper."
- Discuss with your students what the seeds are and their purpose.
- Cut open the banana pepper, show it to your students, seed it, and place its seeds on another paper towel; label the paper towel with a pen or marker, "banana pepper."
- Discuss with your students the similarities and differences between the two types of fruits and the two types of seeds.
- Divide your class into groups of 3-4 students, each.
- Space the groups so that you have room to maneuver around them and so the discussions of one group does not encroach upon the discussions of any other groups.
- Provide each group with one bell pepper and one banana pepper; take one digital photo of each group and its bell pepper and another digital photo of each group with its banana pepper, providing enough detail of each fruit for the students in its respective group to use it as a visual reference over the next few months.
- Have a student from each group hold up their respective peppers for the rest of the class to see, then have your class discuss the similarities and differences among each group's bell peppers and banana peppers, respectively.
- Cut open the peppers for each group and have the students remove the seeds and place them on paper towels, each labeled according to seed type, just as you previously demonstrated.

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Not Exactly Alike, continued…

- Have the groups discuss among themselves what they think the fruit of any peppers grown from the seeds would look like, including whether the offspring fruit would be identical to their parent peppers or simply similar, just as the peppers they all used in their groups were similar but not identical.
- Provide each student with 4 disposable cups, 4 plastic sandwich bags, and 4 seedling starter pellets.
- Have each student label 2 of his/her cups "bell pepper" and 2 of his/her cups "banana pepper" with a pen or marker.
- On the bell pepper cups, have your students write "1" on one cup and "2" on the other; have them also number their banana pepper cups "1" and "2." (See Student Data Sheet at the end of this lesson plan.)
- Have each student place 1 seedling starter pellet in each of his/her cups.
- Assist your students in placing just enough water in each cup to be absorbed by the seedling starter pellets.
- Once the seedling starter pellets have expanded, help your students squeeze out any excess water over a sink or outdoors, then have them poke a little hole in the top center of each expanded seeding starter pellet and place it back into its cup.

- Have each student plant 3 bell pepper seeds in each of the seedling starter pellets in his/her cups labeled "bell pepper," and 3 banana pepper seeds in each of the seedling starter pellets in his her/cups labeled "banana peppers."
- Have each student cover his/her cups with plastic sandwich bags and place them in the designated lighted or sunny spot for germination.
- Have your students note on their Data Sheets the date each of their seedlings were started.
- Have your students dispose of any remaining seeds and clean their work areas; at your discretion, you can clean, slice, and serve the bell and banana peppers to your students as a healthy snack (make sure, first, that no one is allergic to either type of pepper).
- Have your students check their seedling starters daily, making sure that there is enough moisture to condense on the upper portion of the plastic bag, but not enough to leave standing water in the bottom of the cup; they can tap their cups with their fingers to knock condensation off the bag if it is blocking their view and it will recondense, later.
- Have your students note on their Data Sheets the dates their seedling starter pellets first spouted; once a strong sprout is established in a given pellet, without damaging the seedling to remain, have each student pick any additional sprouts that have come up, leaving one, viable sprout in each seedling starter pellet.
- Once the seedlings are about one inch tall, help your students transfer each of their seedling pellets into a small to medium-sized peat pot filled with organic fertilizer– or compost-enriched potting soil and place them back into the designated seedling area; make sure each student marks his/

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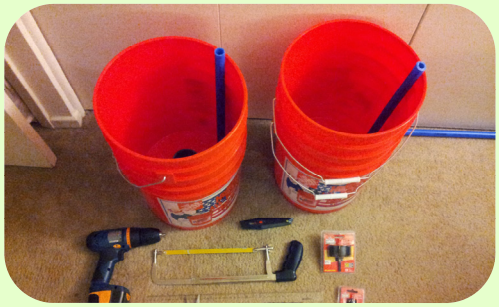
her peat/pots as either "bell pepper" or "banana pepper," accordingly, along with indications of "1" or "2" for the purpose of data collection.

- Have your students monitor their baby pepper plants as they grow in the peat pots; once the plants are at least four inches tall, plant them in self-watering bucket containers, as described in the following.
- Following the instructions at http://learn-and-grow.org, with additional adult support as needed, pre-cut the buckets and PVC pipes for your students until you have enough of each piece to build one self-watering bucket container per student.
- In class, demonstrate to your students how the containers go together:
  1. Upper planter chamber into reservoir
  2. Atrium drain into large hole in planter chamber
  3. PVC pipe through the small hole in the planter chamber
- In the area where the container garden will be



located, have your students assemble their containers; have each student label his/her container with his/her name. (At your discretion, you can have students decorate their self-watering bucket containers as part of an arts project prior to building them out in order to help the students tell their containers apart and beautify the campus at the same time!)

- Once their self-watering bucket containers are assembled, with additional adult support as needed, assist your students in filling the upper planter chambers of their containers with rich, organic potting soil mixed with organic fertilizer or compost.

- Help your students transfer their plants into their containers, labeling each as either bell or banana pepper accordingly, as well as either "1" or "2" so each plant is then identified for data collection purposes. Four mature pepper plants can easily fit into a single self-watering bucket container, if evenly spaced.
- Have your students fill the reservoirs of their containers with water and moisten the surface of the soil around the bases of their plants to start the capillary action that will consistently bring water up from the reservoirs and to the roots of the plants in the planter chambers.
- With your students, monitor and maintain your class self-watering container garden, making sure that the reservoirs are kept sufficiently filled, the plants are fertilized once every 6 weeks, and the plants are safely protected from pests.
- Once the plants bear fruit, have students compare the offspring to the photos of the parent fruits from which the plants came.
- On their Data Sheets, have each of your students rank the plants in his/her personal self -watering bucket container from shortest to tallest and record the ranking on his/her Data Sheet.
- Have each student complete the comparison matrix on his/her Data Sheet.

Where possible, children should be encouraged to eat the fruits and vegetables they grow in order to make the cognitive connections between growing food, where food comes from, how food provides fuel to the human body, and how healthy foods make a difference in how the mind and body feel and work. This also gives them a sense of empowerment and control over their environments that encourages their intrinsic motivation to eat healthy foods.

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Learn & Grow Educational Series℠

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Grade: First

Piagetian Level: Early Concrete

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Name: _____

Student Data Sheet

Seedling Data	Bell Pepper 1	Bell Pepper 2	Banana Pepper 1	Banana Pepper 2
Date Seeded				
Date Sprouted				

Tallest Plant		1st
Second Tallest Plant		2nd
Second Shortest Plant		3rd
Shortest Plant		

Analysis:

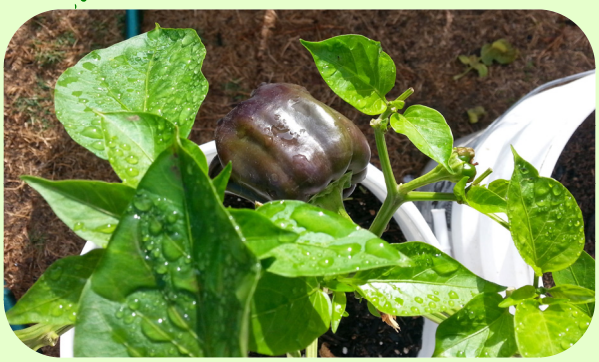
_____ is taller than _____.
[1st Tallest Plant] [2nd Tallest Plant]

_____ is taller than _____.
[2nd Tallest Plant] [3rd Tallest Plant]

If the 1st tallest plant is taller than the 2nd tallest plant, and the 2nd tallest plant is taller than the 3rd tallest plant, which plant is taller?

☐ 1st

☐ 3rd



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