

Grade Level: Third
Piagetian Level: Concrete

This assignment is suitable for learners with established and developing concrete operations.

STEM Science, Technology, Engineering, & Mathematics



Learn & Grow
Educational Series™

Gardening During Drought Conditions

Instructional Goal: Following instruction, students will demonstrate an understanding of how the design solution of self-watering containers made from recycled 5-gallon buckets can reduce the amount of water needed to grow fresh fruits and vegetables in drought conditions compared to traditional forms of gardening and agriculture.

Lines of Inquiry:

- How much water is needed to grow fruits and vegetables using traditional watering methods during drought-like conditions?
- How much water is needed to grow fruits and vegetables in Learn & Grow self-watering bucket containers during drought-like conditions?

Materials:

- Tools & materials for building out one self-watering container per student (see <http://learn-and-grow.org> for instructions & materials)
- One 5-gallon *unglazed* terra cotta pot with accompanying drainage dish per group of 4 students (do NOT substitute any other type of pot - unglazed terra cotta breathes and helps create more drought-like conditions for this experiment)
- One tall wire tomato cage per group of 4 students

- One 2 mil 9ft x 12ft plastic drop cloth per group of 4 students
- Gardening wire (or recycled twist-ties)
- Organic potting soil with compost or fertilizer mixed into it—enough for each container, both self-watering and terra cotta
- 3-gallon watering cans marked with graduated scales to track water usage, one per group of 4 students
- One funnel per group of 4 students that can fit inside the PVC pipe to aid in adding *measured amounts* of water to the reservoirs of the self-watering containers without spilling
- A polyculture blend of baby plants suitable for the season and your area (for example: a tomato plant, a kale plant, and 3 fava bean plants); baby plants can be started from seeds by you and/or your class, or you can obtain them for purchase or as a donation from a local nursery
- A dedicated space for your students' container garden with nearby access to water

Instructions:

- Prior to instruction, with additional adult support as needed, pre-cut and drill the 5-gallon buckets and PVC pipes for your students' self-watering bucket containers.

Common Core Standards:

- W.3.1. Write opinion pieces on topics or texts, supporting a point of view with reasons.
- W.3.7. Conduct short research projects that build knowledge about a topic.
- MP.2. Reason abstractly and quantitatively.
- MP.4. Model with mathematics.

CA State Standards—Science:

- 3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.



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Gardening During Drought Conditions, continued...

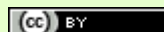


- Following the instructions found at <http://learn-and-grow.org>, demonstrate to your students how the parts of the self-watering containers go together and have each assemble his/her own self-watering bucket containers; each student should have his/her own self-watering bucket container.
- With additional adult support as needed, assist your students in filling the upper chambers of their self-watering bucket containers with soil.
- Divide your class into groups of 4 students each.
- Provide each group of 4 students with a 5-gallon unglazed terra cotta pot with accompanying drainage dish.
- With additional adult support as needed, assist your students in filling their terra cotta pots with soil.
- Have each group of 4 students arrange their containers such that each group's terra cotta pot is in the center with its student's self-watering container creating 4 points of a square oriented around the terra cotta pot.
- With additional adult support as needed, assist your students in planting one polyculture combination of plants per your previous design in their respective self-watering containers.
- Assist each group in planting one polyculture combination of plants per your previous design in their respective terra cotta pots.
- Have your students fill the reservoirs of their self-watering containers using the watering cans and funnels; have each student record how much water was initially placed into his/her self-watering container's reservoir on his/her data sheet (found at the end of this lesson plan); the container's reservoir is full when water starts coming out of the container's "weep hole."
- Similarly, assist your students in adding water to the planted terra cotta pot until water begins to collect in the drainage dish; have them record how much water they added to the terra cotta pot on their data sheets.
- With additional adult support as needed, assist your groups of 4 students in placing their tomato cages in their terra cotta pots and draping their drop cloths such that all of their containers are beneath the "tent" created, with none of the plastic falling into their containers and with enough ventilation for evaporation to occur and to prevent humidity from building up (you may need to prop up the plastic around the outside perimeter of a group's growing space with additional tomato stakes and/or trim the plastic back in places with scissors); use gardening wire to secure the plastic to the tomato cage.



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Gardening During Drought Conditions, continued...



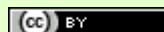
- Explain to your students that the plastic ensures that the only water their plants receive will come from them and not nature, but that they will still get the same sunlight and air they would otherwise get if they weren't covered.
- Have your students check their containers daily, adding water and recording how much has been added to their containers as needed over the next 90 days on their data sheets.
- At the end of 90 days, have each of your students create a graph of the water used in their respective group's terra cotta pot compared to the water used in their individual self-watering containers.
- Have your students remove the plastic from their growing spaces and grow their plants to harvest.
- During class, discuss with your students the differences between the growing conditions in the terra cotta pots and the self-watering containers.
- Have your students discuss as a class their data on the water usage in the terra cotta pots versus the self-watering containers and how it might relate to the data they collected regarding their water usage in the different types of containers.
- Discuss with your class what drought conditions are and how the artificial growing conditions they created with their self-watering bucket containers and terra cotta pots are similar to drought conditions.
- Pose the following questions to your students and guide their discussions according to their evidence:
 - Why is it important during drought conditions to conserve water?
 - Which type of container used the least amount of water?
 - Why is it important to explore ways to grow food with as little water as possible in places where there are droughts?
- After harvest, have your students each write a one-page summary of his/her experimental findings and interpretations, with a specific focus on water consumption in gardening during drought conditions.



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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Gardening During Drought Conditions

Name: _____

Student Data Sheet

The other people in my group are: _____

Date of planting	
Amount of water added to self-watering container	
Amount of water added to terra cotta pot	

Date Water Added	Amount of Water Added	Container	Date Water Added	Amount of Water Added	Container



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