Water, water anywhere?

Teacher
_____

Topic & Title:
Growing Arizona Pecans
Water conservation

Grade Level:
2-4

Relevant AZ Science Standards, Grades 2-4:
 S1.C1.PO2. Predict the results of an investigation (e.g., in animal life cycles, phases of matter, the water cycle
 S1.C2.PO2. Participate in guided investigations in life, physical, and Earth and space sciences.
 S1.C2.PO3. Use simple tools such as rulers, thermometers, magnifiers, and balances to collect data (U.S. customary units).
 S1.C3.PO2. Construct reasonable explanations of observations on the basis of data obtained (e.g., Based on the data, does this make sense? Could this really happen?).
 S1.C4.PO1. Communicate the results and conclusions of an investigation (e.g., verbal, drawn, or written).
 S1.C4.PO3. Communicate with other groups or individuals to compare the results of a common investigation.
 S3.C2.PO1. Identify ways that people use tools and techniques to solve problems.
 S3.C2.PO3. Identify a simple problem that could be solved by using a suitable tool.
 S4.C3.PO1. Describe ways various resources (e.g., air, water, plants, animals, soil) are utilized to meet the needs of a population.
 S4.C3.PO5. Describe how environmental factors (e.g., soil composition, range of temperature, quantity and quality of light or water) in the ecosystem may affect a member organism's ability to grow, reproduce, and thrive.

Objective:
Students will be able to describe how important water conservation is to farmers.
Students will be able to explain the methods that pecan farmers in Sahuarita, Arizona use to water the pecan trees on their farm.
Students will be able to design water conservation methods for their family garden at home.

Evidence of Mastery:
Formative - Student worksheets and informal questioning
Summative - Students ability to design a garden with appropriate water conservation systems in place
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Background Knowledge:
How to read a measuring cup and fill it to the proper line.
Design process- ask, explore, model, evaluate, explain

Misconceptions (Possible misleading thoughts students might have):
Farmers use too much water making it unavailable for human consumption, local rivers, and aquatic animal habitat.

Process Skills (Skills are you introducing or reinforcing; ex. observation – reinforcing; prediction – introducing):
Observation, Predictions, Scientific testing, and Analysis

Safety (Safety rules and procedures that need to be addressed):
Be careful not to spill any water on the floor – this can cause slipping hazards. Be sure to work over a desk or table when pouring water or filling your measuring cup.

Management Technique:
General classroom management procedures: call backs, timers, questioning, etc.

Essential Question:
How do pecan farmers ensure they are only using as much water as their trees need? What methods do they use to prevent the waste of water?

Inquiry Questions (Testable in the here and now):
Is there enough water to spread over the entire pecan farm?
What three methods can be used to make sure there is enough water for the pecan trees?

Key vocabulary (List and define):

Conservation: preserving or protecting something.
Water: the one resource that every living thing on earth needs in order to survive.
Pecans: a type of nut frequently eaten by people.
Farmers: people who raise animals or grow vegetables or fruits for people to eat.
Sprinklers: a device that sprays water.
Barriers: a mound of dirt that keeps water in a certain area.
Weeds: unwanted plants that grow and use up nutrients and water that the trees need.

Materials (per group):

1 Tupperware container with 6 dots made with a sharpie – see "Pecan Farm Key" for a diagram (5"x8" or any dimension combination **no smaller** than 40in^2 in size)
1 1-cup measuring cup
6 water bottle caps each marked with one dot using the sharpie – see "Pecan Farm Key" for a diagram
4 1" square pieces of sponge
¼ cup of water in the measuring cup
1 Pecan Farm Key

Engage

The Pecan Tree Poem by Amy Lohrman

Teacher Will:

1) Read aloud *The Pecan Tree Poem* by Amy Lohrman.
2) As you read ask students questions to focus them on what pecans are, where they grow, and what they are used for.
3) After completing the poem discuss with students that pecans are nuts that grow on large trees (in Arizona) and are used for baking and cooking, and sometimes just a snack!

Student Will:

1) Students will answer questions (provided) about pecans as the poem is being read aloud by the teacher.

Explore

Water, water anywhere? Activity, Part 1

Teacher Will:

1) Have students think about a farm that is full of giant pecan trees. Will they require a lot of water to produce delicious pecans? Would it make sense to flood the entire farm with water?
3) **Pose inquiry question**: How can farmers be sure they are only giving the trees the water they need and not wasting it?
Pass out supplies and have students explore whether watering the entire farm results in all trees getting enough water.

Student Will:

1) Students will discuss how much water they think pecan trees need, and whether it makes sense to flood the farm.
2) In groups students will use their supplies to discover the answer to the inquiry question through the first part of the "Water, water anywhere?" activity

Explain

Teacher Will:

1) After all groups have shared their findings with at least 1 other group discuss as a class.
2) Discuss data: was there enough water to flood irrigate the whole farm? Using the same amount of water, how can we make sure all of the trees get enough water? Explain that they use sprinklers, barriers, and weed control.

Student Will:

1) Students will share their results with at least 1 other group and compare their findings.
2) Students will discuss possible solutions to be sure the same amount of water is able to water all of the trees.

Elaborate

Water, water anywhere? Activity, Part 2

Teacher Will:

1) **Pose inquiry question**: How can farmers be sure they are only giving the trees the water they need and not wasting it?
2) Pass out supplies and have students explore whether barriers, sprinklers, and weed control allows for more efficient use of the water.
3) After students take their measurements, have a brief class discussion with the following questions:
1. Did you use the same amount of water?
2. Did the trees get more or less water when the weeds (sponges) soaked up water?
3. Did the trees get more or less water when the barriers and sprinklers were used?
4. Why did they get more water even though you used the same amount?

Student Will:

1) In groups students will use their supplies to discover the answer to the inquiry question through the second part of the "Water, water anywhere?" activity.
2) Students will observe how the same amount of water can actually allow trees to get MORE water if barriers, sprinklers, and weed control are used.
3) Students will discuss as a class whether or not their hypothesis was correct.

Evaluate

YouTube video: "In The Orchard Series, Ep 20; Water Conservation" (1 min 41 sec)
www.greenvalleypecan.com

Teacher Will:

1) Show the YouTube video about pecan farm water conservation. This will review the sprinklers, barriers, and weed control discovered during the activity. Ask review questions to check for understanding.
2) Go to the Green Valley Pecan website. Click on "Our Farm" at the top of the page. Scroll down and read the section "Innovation" about how they responsibly control the process of growing and harvesting pecans while conserving resources. You will need to elaborate on this as needed, as well as asking review questions to check for understanding.

Student Will:

1) Students will answer questions about the YouTube video.
2) Students will answer questions about innovation and conserving resources.

Closure

Blank paper, Design a garden

Teacher Will:

1) Why do you think farmers want to conserve and not waste water? How have they used innovation to conserve water? On a blank sheet of paper, draw a garden you could make at home in your back yard (or nearby in a community garden) and show how you would be sure you are also conserving water while gardening.

Student Will:

1) Students will show what they have learned by drawing a garden that illustrates effective water conservation techniques.

The Pecan Tree Poem

by Amy Lohrman

There is a tree outside my window,
With branches strong and wide.
The tree is not inside my house,
Because trees... grow outside.

I look upon the branch's tips
I look among the leaves.
What I see it pleases me,
They sway forth with the breeze.

Green casings are popping open,
New pecans are bursting forth.
Knowing not their dismal fate
Or their scanty worth.

One will fall onto the ground
Where it will decay so smelly.
One will find it's way into
A greedy rodent's belly.

Yet another pecan will drop and be
Picked up by a passerby,
Only to be painfully shelled
And cast into a pie!

Questions:

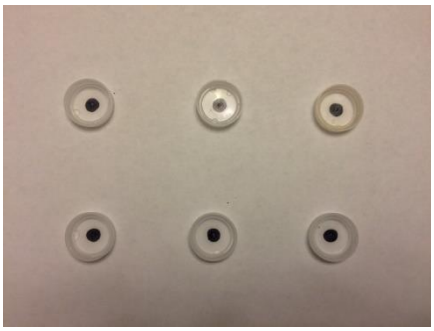
1) Where do pecans grow? In the ground? On a bush?
2) When pecans fall to the ground, what can happen to them?
3) When farmers harvest pecans, they shake them off the tree before they have a chance to fall to the ground on their own. Why don't farmers just wait until they fall off?
4) Is it easy or hard to take the shell off of a pecan nut?

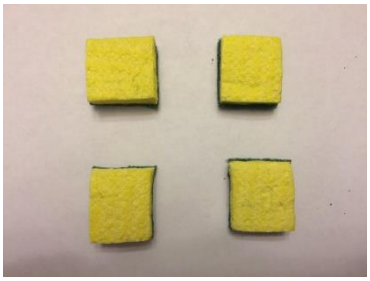
TEACHER SUPPLY LIST:

Tupperware container (the tree farm) with 6 dots (each dot is a tree) made with a sharpie – you can make the dots on the outside of the container if you don't want to ruin the container.
(5"x8" or any dimension combination **no smaller** than 40in^2 in size)

1-cup measuring cup

6 water bottle caps each marked with one dot using the sharpie (each cap represents an area watered by sprinklers OR an area confined by barriers – dots still represent trees)





4 - 1" square pieces of sponge (each sponge represents weeds)

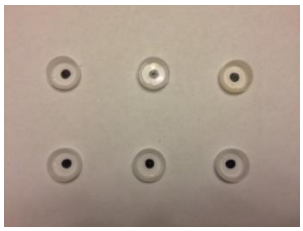
¼ cup of water in the measuring cup

1 Ruler

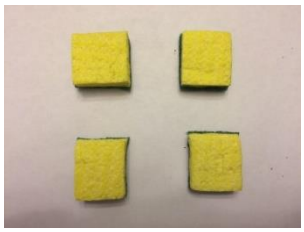
1 Pecan Farm Key and 1 analysis sheet

PECAN FARM KEY

= Your pecan tree farm. Each dot is a tree.



= Barriers OR areas watered by sprinklers.
Each dot is a tree.



= Weeds

WATER, WATER ANYWHERE?
TEACHER DIRECTIONS

STEP 1 – Split your class into groups of 3-4

STEP 2 – Pass out the supplies to each group

>one Pecan Farm Key
>one Tupperware container
>four pieces of sponge
>six water bottle caps
>one measuring cup with ¼ cup of water
>one ruler
>one analysis sheet

STEP 3 – Explain the purpose of the activity, and what each supply represents.

STEP 4 – Have students pour ¼ cup of water into the empty Tupperware. Have them answer question 1 on the data sheet after they measure the depth of water at every tree using the ruler.

STEP 5 – Pour the water back into the measuring cup.

STEP 6 – Add the four sponges (weeds) to the farm. Repeat STEP 4. Have them answer question 2 on the data sheet after they measure the depth of water at every tree using the ruler.

STEP 7 – Remove the weeds, pour any leftover water from the farm back into the measuring cup. Refill the measuring cup to ¼ cup of water.

STEP 8 – Add the six bottle caps. Place the black dot on the cap directly over the black dot in the Tupperware. (This shows the trees are still there)

STEP 9 – Pour the water from the measuring cup into each of the bottle caps ONLY until each are full. Have them answer question 3 and 4 on the data sheet after they measure the depth of water at every tree using the ruler.

STEP 10 – Have them answer question 5 on the data sheet.

STEP 11 – Have them clean up.

Water, water anywhere? Analysis sheet

Question 1:

True or false: When we watered the trees in our farm without using barriers, sprinklers, or weed control, there was enough water to water every tree with $\frac{1}{4}$ inch of water.

Question 2:

What happened to the amount of water available to the trees when weeds were present?

_____

Question 3:

When barriers were put up around each tree OR sprinklers were added next to each tree (so only the tree was watered and nothing else), was there enough water for each tree? _____

Question 4:

True or false: When we watered the trees in our farm, there was enough water to water every tree with $\frac{1}{4}$ inch of water.

Question 5:

There isn't enough water for farmers to just pour water, water anywhere! They have to be smart with how they use their water. Explain why it is such a great idea that pecan farmers use each of the following water conservation methods:

Barriers: _____

_____

Sprinklers: _____

_____

Weed control: _____

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