

Trees in the Desert: Using the Principles of Xeriscape

Author Grade Level Duration Kathryn Anderson 6-8 2 class periods

National Standards

ELEMENT FIVE: ENVIRONMENT AND SOCIETY 14. How human actions modify the physical environment.

AZ Standards

ELA Writina

Production and Distribution of Writing

6.W.4, 7.W.4, 8.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **Research to Build and Present Knowledge**

6.W.9, 7.W.9, 8.W.9 Draw evidence from informational texts to support analysis reflection, and research.

MATHEMATICS

Expressions and Equations

6.EE.C.9. Use variables to represent two quantities in a realworld problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables and relate these to the equation.

7.EE.B.4. Use variables to represent quantities in a real-world or mathematical problem and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form px+q=r and p(x+q)=r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Arizona Social Science Standards

GEOGRAPHY

Human-environment interactions are essential aspects of human life in all societies.

6.G2.1 Compare diverse ways people or groups of people have impacted, modified, or adapted to the environment of the Eastern Hemisphere. Key concepts include but are not limited to hunter-gatherer communities, human settlement, Neolithic Revolution, irrigation and farming, domestication of animals, and influence of climate and seasons.

7.G2.1 Explain how cultural demographic patterns, economic decisions, and human adaptations shape the identity of nearby and distant places.

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8.G2.1 Examine impact of and responses to environmental issues such as air, water, and land pollution, deforestation, urban sprawl, and changes to climate.

8G2.2 Evaluate how political, social, and economic decisions throughout time have influenced cultural and environmental characteristics of various places and regions.

ECONOMICS

By applying economic reasoning, individuals seek to understand the decisions of people, groups, and societies.

7.E2.2 Evaluate current economic issues in terms of benefits and costs for distinct groups in society.

CIVICS

Process, rules, and laws direct how individuals are governed and how society addresses problems

8.C4.4 Identify, research, analyze, discuss, and defend a position on a national, state, or local public policy issue including an



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8.EE.8. Analyze and solve pairs of simultaneous linear equations. c. Solve real-world and mathematical problems leading to two linear equations in two variables.

Standards for Mathematical Practice

6.MP.1, 7.MP.1, and 8.MP.1 Make sense of problems and persevere in solving them. 6.MP.4, 7.MP.4, and 8.MP.4 Model with mathematics. action plan to address or inform others about the issue. DISCIPLINARY SKILLS AND PROCESSES Historians and Social Scientist gather, interpret, and use evidence to develop claims and answer historical, economic, geographical, and political questions and communicate their conclusions. 6.SP3.7, 7.SP3.7, 8.SP3.7 Construct and present explanations using reasoning, correct sequence, examples and details with relevant information and data.

Overview

Residents of Arizona must adapt to the dry climate by planting native and/or drought tolerant trees and plants. This practice not only saves money for the owner, but also conserves water by using less of it more efficiently.

Purpose

In this lesson students will gain a better understanding of how the principles of xeriscape can help residents of Arizona conserve water in landscaping. They will use T-charts and functions to calculate how much water native trees versus nonnative trees use.

Materials

- Handout #1: Xeriscape Program
- Handout #2: Estimated Water Requirements for Tucson
- Handout #3: Estimated Water Requirements for Phoenix
- January Water Use T-Chart: Answer Sheet for Tucson
- January Water Use T-Chart: Answer Sheet for Phoenix
- Handout #4 Water Use T-Charts
- Handout #5: Assessment: Trees for the Parking Lot
- Handout #6: Rubric for *Trees for the Parking Lot* Paper, pencil
- Sample Response: Trees for Parking Lot June Calculations for Tucson
- Sample Response: Trees for Parking Lot June Calculations for Phoenix
- Calculators (optional)

Objectives

The student will be able to:

- 1. State the basic principles of xeriscape, and the reasons for using these principles.
- 2. Name some native trees of southern Arizona.
- 3. Complete and analyze a T-chart of water usage for different types of trees.

4. Produce a rule (function) that explains the relationship between the number of days of watering and the amount of water used.

5. Explain the reasons for xeriscaping in a formal letter.

Procedures

Prerequisite Skills: Students should have experience in functions and T-charts.

SESSION ONE

1. Ask students what kinds of trees they typically see in yards around their neighborhoods. Would the trees be the same if you visited a neighborhood in some other part of the country? Why or why not? 2. Introduce the term "xeriscape". Show or read students the definition of xeriscape and the principles of xeriscape - Handout #1. How do homeowners or businesses of southern Arizona apply the principles of xeriscape to their lawns? Why is it important to minimize water usage in southern Arizona? (Students should have noticed that many businesses and homeowners cover their yards with gravel interspersed with native plants. Some students may point out that they have seen irrigation systems around the plants. We need to minimize water use because we live in a desert and water is a limited resource.)

3. Ask students to list some trees that are native to Arizona and some that are not native. How does the



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water usage vary between the two? Pass out Handout #2 - "Estimated Water Requirements in Tucson" or Handout #3 - "Estimated Water Requirements in Phoenix" to each student. How does this chart show the importance of xeriscape? (Some native trees of southern Arizona include mesquite, Palo Verde, and sweet acacia. Examples of non-native trees include oak, maple, and mulberry. Students should notice that the fruit and high water trees in the chart tend to need more than twice as much water as the native trees.) 4. Suppose you were watering a native tree in January, how many gallons of water would you use in a week? In two weeks? (Tucson: 1.3 gallons for one week, 2.6 gallons for two weeks. Phoenix: 1.2 gallons for one week, 2.4 gallons for two weeks.) How does this compare to the amount of water used in a week to water a fruit tree in January? (A fruit tree needs 2.9 [Tucson] or 2.5 [Phoenix] gallons a week – more than twice the amount needed for the native tree.)

5. Distribute Handout #4 "Water Use T-charts." Ask students to fill in the first T-chart for 1-10 days of watering a native tree in January. Instruct students to finish the other charts for homework.

SESSION TWO

1. Ask students to check the numbers on their T-Charts. How did you calculate the amount of water used in 20 days? 30 days? Any number of days? (*Multiply the amount of water used in one day times the number of days*) How could you express this relationship in an algebraic equation? (*Possible answers:* [*Tucson*] W = 1.3D, where W stands for gallons of water and D for number of days. OR y = 1.3x. [Phoenix] W = 1.2D, where W stands for gallons of water and D for number of days. OR y = 1.2x)

2. Distribute Handout #5 - *Trees for the Parking Lot* worksheet and Handout #6 - Rubric for *Trees for the Parking Lot*. Review the problem with students and instruct them to work in small groups to come up with a recommendation to the store.

3. Have students share their recommendations with the class.

Assessment

Geography

The Trees for the Parking Lot worksheet can be graded using the rubric provided. Mastery will be considered a score of 3 or higher.

Mathematics

The T-Chart can be graded using the rubric provided. Mastery will be considered a score of 3 or higher.

Sources

The Arizona Municipal Water Users Association has information and links about xeriscaping and trees: <u>http://www.amwua.org/what-you-can-do/landscapeand-garden</u> http://www.amwua.org/plants/trees.php

Botanical gardens websites: Phoenix <u>https://www.dbg.org/</u> Boyce Thompson Arboretum <u>http://www.btarboretum.org/</u>

