

Pull, Pull, Pulleys in Mesopotamia

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Grade Level 6
Duration 3 class periods

National Standards

GEOGRAPHY

Element 5: Environment and Society

- 14. How human actions modify the physical environment
- 15. How physical systems affect human systems
- 16. The changes that occur in the meaning, use, distribution, and importance of resources

NEXT GENERATION OF SCIENCE STANDARDS

MS. Human Impacts

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

MS. Engineering Design

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

AZ Standards

ELA

Writing Production and Distribution of Writing

6.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Language Vocabulary

Acquisition and Use

6.L.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

SCIENCE

Life Science

6.L2U1.14 Construct a model that shows the cycling of matter and flow of energy in ecosystems.

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.

Examining human population and movement helps individuals understand past, present, and future conditions on Earth's surface.

6.G3.1 Analyze how cultural and environmental characteristics affect the distribution and movement of people, goods, and ideas.

6.G3.2 Analyze the influence of location, use of natural resources, catastrophic environmental events, and technological developments on human settlement and migration.

HISTORY

The development of civilizations, societies, cultures, and innovations have influenced history and continue to impact the modern world.

6.H1.1 Compare the development and characteristics of historical cultures and civilizations from different global regions within designated time periods.

6.H1.2 Explain the causes and effects of interactions between cultures and civilizations.

SIOP Elements		
Preparation Adapting content Linking to background Linking to past learning Strategies used	Scaffolding Modeling Guided practice Independent practice Comprehensible input	Grouping Option Whole class Small groups Partners Independent
Integrating Processes Reading Writing Speaking Listening	Application Hands on Meaningful Linked to objectives Promotes engagement	Assessment Individual Group Written Oral

Arizona English Language Proficiency Standards
Grade 6 Basic Listening and Reading Standard 1 By the end of each language proficiency level, an English learner can construct meaning from oral presentations and literary and informational text through grade appropriate listening, reading, and viewing. B-1: determine the central idea or theme and explain how they are supported by using some text evidence. B-2: recount specific details and information in a variety of texts. Speaking and Writing Standard 3 By the end of each language proficiency level, an English learner can speak and write about grade appropriate complex literary and informational texts and topics. B-3 compose informational text that includes details to develop a topic while using appropriate conventions. B-5: use examples of precise language and domain-specific vocabulary within informative texts. Listening, Speaking, Reading, and Writing Standard 6 By the end of each language proficiency level, an English learner can participate in grade-appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions. B-1: participate in discussions about familiar topics and texts. B-2: participate in written exchanges about familiar topics and texts. B-5: contribute relevant information and evidence to collaborative oral and written discussions.

Overview

Students often have no concept of what engineering designs and concepts have preceded them. They are so accustomed to machines doing man’s work that they don’t fully appreciate the evolution of technology.

Purpose

In this lesson, students will learn about the ancient civilization of Mesopotamia and how man created the pulley to make his life easier. This lesson includes strategies for diverse learners (ELLs).

Key Vocabulary

- lift:** to bring upward
- energy:** the ability to do work
- machine:** a device that makes work easier
- simple machine:** a device with few or no moving parts
- pulley:** a grooved wheel with a rope around it
- groove:** a cut in the surface

Materials

- Reading on Mesopotamia
- Pulley Vocabulary
- The Pulley readings (#1 is more difficult than #2)
- Engineering Design Process worksheet

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- Group Work Score Sheet
- Writing Assignment
- Scoring Rubric for Building a Pulley
- Vocabulary Cards and Vocabulary Test
- What is Civil Engineering? reading (optional)
- 1 thread spool per group
- String
- Round pencils
- Paperclips
- Small paper cups
- Water
- Sand to act like water (optional)
- Scissors

Objectives

The student will be able to:

- Use vocabulary associated with history and science.
- Apply the Engineering Design Process to create a device using a pulley.
- Explain how the people of Mesopotamia interacted with their environment.

Procedures

Prior Knowledge: Students will have read about Mesopotamia in their textbook or use the optional materials to give students some background in The Fertile Crescent.

SESSION ONE

Engage:

1. Introduce the lesson by saying, "Today and tomorrow, you will function as an engineer working with a team of other engineers. You will be designing a device that can move water. The device will be used in Mesopotamia."
2. Review the textbook information or do the optional Reading on Mesopotamia. **(Preparation: Linking to Past Learning)**

Explore:

3. Divide the students into groups of four or five. **(Grouping Option: Small groups)**
4. Pose the problem: People in ancient Mesopotamia need to move water from its source (Tigris or Euphrates River) to where they will use it. With your team, draw out a solution to this problem by creating a device that can move water.
5. Allow students enough time to collaborate and then draw their devices.
6. Have the students share orally their designs and how their devices work with a partner group.

(Application: Promotes Engagement)
(Integrated Processes: Speaking)

Explain:

7. End the lesson by projecting the Pulley Vocabulary and explaining any of the vocabulary words that are unfamiliar to the students. **(Scaffolding: Comprehensible Input)**
8. Read and explain either #1 or #2 of The Pulley readings. **(Integrated Processes: Reading)**
9. Close this session with a ticket out the door: Describe how a pulley works using at least 3 of the vocabulary words. **(Assessment: Written, Individual)**

SESSION TWO

Elaborate:

10. Reassemble the groups from Session One. Give each group an Engineering Design Process worksheet. **(Grouping Option: Small groups)**
11. Show them the materials they may use (scissors, thread spool, round pencil, paper cups, paper clips, string, and water or sand).
12. Have them start by defining the problem (build a device that uses a pulley and can move water) and the constraints (must use classroom materials (Ask) and then continue to brainstorm ideas and select the best one (Imagine).
13. After they show you the group's diagram and materials list (Plan), they can get materials and begin assembling their device (Create).
14. Stop the groups at some point so they can see each others' devices. Then have them return to their own device and make adjustments (Improve). **(Application: Hands on, Promotes engagement)**

SESSION THREE

15. Show the PowerPoint on Mesopotamia. Emphasize how water was an important part of this civilization. **(Integrated Processes: Listening)**

Evaluate:

16. Have students evaluate their performance on the group task using the Group Work Score Sheet.
17. Explain the writing assignment and how it will be graded. If students are not finished with the writing assignment, it can be completed as homework. **(Assessment: Individual, Group, Written)**

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Assessment

Science

The engineering activity can be graded using the Scoring Rubric for Building a Pulley. Mastery will be considered a score of 3 or higher in each category.

Participation points can be given for the engineering activity. Students should score an average of 75% of the points possible as given by their teammates on the Group Work Score Sheet.

ELA and Social Science

The Writing Assignment can be graded using the 6 Traits Writing Rubric focusing on Ideas and Content. Mastery will be considered a score of 4 or higher on the rubric.

To measure language acquisition, students will score 80% or higher on the Vocabulary Test.

Extensions

Students can learn about Civil Engineering by reading and discussing the optional reading provided.

Sources

<http://www.newworldencyclopedia.org/entry/Pulley>

Overview information on Mesopotamia
<http://mesopotamia.mrdonn.org/geography.html>