Pull, Pull, Pulleys in Mesopotamia

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Grade Level: 6
Duration: 3 class periods

National Standards
GEOGRAPHY STANDARDS
Element Five: 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.

ELA COMMON CORE
Reading Standards for 6-8 for Literacy in History/Social Studies
Key Ideas and Details
6-8.RH.4. Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.

6-8.RH.7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

6-8 Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects
Production and Distribution of Writing
6-8.WHST.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
a. Produce clear and coherent functional writing (e.g., formal letters, envelopes, procedures, labels, timelines, graphs/tables, experiments, maps, captions, diagrams) in which the development, organization, and style are appropriate.

Common Core Standards

Other Arizona Standards
SOCIAL STUDIES STANDARDS
Strand 2
World History
Concept 2: Early Civilizations
PO6 Analyze the impact of cultural and scientific contributions of ancient civilizations on later civilizations:
a. Mesopotamia (i.e., laws of Hammurabi)

PO8 Describe scientific and cultural advancements (e.g., networks of roads, aqueducts, art and architecture, literature and theatre, mathematics, philosophy) in ancient civilizations.

Strand 4
Geography
Concept 5: Environment and Society
PO 1 Describe ways that human dependence on natural resources influences economic development, settlement, trade, and migration.

Concept 6: Geographic Applications
PO 1 Describe ways geographic features and conditions influenced settlement in various locations (e.g., near waterways, on high terrain, with adequate fresh water, on good land for farming, in temperate climates) throughout different periods of time, places, and regions.

SCIENCE
Strand 2: History and Nature of Science
Concept 1: History of Science as a Human Endeavor
PO2 Describe how a major milestone in science or technology has revolutionized the thinking of the time.

Strand 3 Science in Personal and Social Perspectives
Concept 2: Science
environment that may limit possible solutions.

PO 3. Design and construct a solution to an identified need or problem using simple classroom materials.

PO 4. Describe a technological discovery that influences science.

SIOP Elements

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TESOL Standard(s)

ESL: English For Content
Through The Use Of ESL Methodologies, The Student Will:
EFC-A. Create, read and interpret visual information relating to science, social studies and math.
A5. Create visuals to present information.
EFC-C. Compose in a variety of forms.
C1. Use Math, Social Studies, and Science target vocabulary.
EFC-D. Communicate clearly using math, science, and social studies target vocabulary.
D2. Participate in small and large groups.
EFC-E. Comprehend reading materials.
E1. Read a variety of Math, Science, and Social Studies materials.

Arizona English Language Proficiency Standards

Stage IV
Basic
Reading
Standard 4: The student will analyze text for expression, enjoyment, and response to other related content areas. The student will demonstrate knowledge of reading comprehension by:
B-8: summarizing the main idea and supporting details from text.
B-21: applying understanding of content area vocabulary within math, science and social studies texts.
B-23: locating information in print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodicals, website, and textbooks) periodicals for a specific purpose.
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Writing
Standard 1: The student will express his or her thinking and ideas in a variety of writing genres.
The student will express his or her thinking and ideas by using a variety of writing genres, as demonstrated by
B-4: writing a paragraph based on research using topic sentences, main ideas, relevant facts, details, and concluding statements.
B-8: writing a persuasive paragraph using facts, ideas and concepts to influence the reader.

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.

Students don’t always appreciate the civilizations that have come before them. Some of these civilizations survived because of their locations and their ingenuity.

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
• Scoring Rubric for Building a Pulley
• Group Work Score Sheet
• Reading on Mesopotamia (optional)
• The Pulley readings (#1 is more difficult than #2)
• Pulley Vocabulary List and Vocabulary Cards
• Engineering Design Process worksheet
• 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 science
• use 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 reading to give students some background in The Fertile Crescent.

SESSION ONE
Engage: 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.” Then review the textbook information or do the optional Reading on Mesopotamia. (Preparation: Linking to Past Learning)

Explore: Divide the students into groups of four or five. (Grouping Option: Small groups) 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. Allow students enough time to collaborate and then draw their devices. Have the students share orally
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their designs and how their devices work with a partner group. (Application: Promotes Engagement) (Integrated Processes: Speaking)

Explain: Go over the Pulley Vocabulary. (Scaffolding: Comprehensible Input)
Read and explain either #1 or #2 of The Pulley readings. (Integrated Processes: Reading)
Close this session with a ticket out the door: Describe how a pulley works using at least 3 of the vocabulary words. (Assessment: Individual)

SESSION TWO
Elaborate: Reassemble the groups from Session One. Give each group an Engineering Design Process worksheet. (Grouping Option: Small groups) Show them the materials they may use (scissors, thread spool, round pencil, paper cups, paper clips, string, and water or sand). 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). After they show you the group’s diagram and materials list (Plan), they can get materials and begin assembling their device (Create). 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
Show the PowerPoint on Mesopotamia. Emphasize how water was an important part of this civilization. (Integrated Processes: Listening)

Evaluate: Have students evaluate their performance on the group task using the Group Work Score Sheet. 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)

Assessment

To be considered mastery, students will score:
- 3’s or higher on the Scoring Rubric for Building a Pulley.
- An average of 8 or higher on Group Work Score Sheet.
- 4 or higher on the 6 Traits Writing Rubric for their paragraph about Mesopotamia and its dependence on water. They traits that will be scored are Ideas and Content and Voice.
- 100% on the Engineering Design Process worksheet for completion.
- 100% on the Vocabulary Test of the vocabulary used in the lesson.

Extensions

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

Students can play an online game that identifies various simple machines including a pulley.
http://www.edheads.org/activities/simple-machines/

Sources

Pulley information
http://www.scientech.technomuses.ca/english/schoolzone/Info_Simple_Machines2.cfm#simple
http://www.newworldencyclopedia.org/entry/Pulley

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