Sail Like an Egyptian: Alternative Energy

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Grade Level	6
Duration	4 class periods

National Standards

GEOGRAPHY STANDARDS
Element Four: Human Systems
10. The characteristics, distribution and complexity of Earth's cultural mosaics.
11. The patterns and networks of economic interdependence.

NEXT GENERATION OF SCIENCE STANDARDS
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.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria

Common Core Standards

ELA COMMON CORE
Reading Standards for 6-8 for Literacy in History/Social Studies
Key Ideas and Details
6-8.RH.1 Cite specific textual evidence to support analysis of primary and secondary sources.
6-8.RH.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
Integration of Knowledge and Ideas
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, charts, diagrams) in which the development, organization, and style are appropriate.

Other Arizona Standards

SOCIAL STUDIES STANDARDS
Strand 2 World History
Concept 2: Early Civilization
PO 8. 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.

for success.

SCIENCE STANDARDS
Concept 3: Transfer of Energy
PO 1. Identify various ways in which electrical energy is generated using renewable and nonrenewable resources (e.g., wind, dams, fossil fuels, nuclear reactions).

	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

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.
EFC-C. Compose in a variety of forms.
C1. Use Math, Social Studies, and Science target vocabulary.
C4. Compare and contrast using Math, Science, and Social studies target vocabulary.
A5. Create visuals to present information.
EFC-E. Comprehend reading materials.
E1. Read a variety of Math, Science, and Social Studies materials.
E3. Use new English vocabulary.
E5. Demonstrate basic reading skills.
E6. Scan material for relevant information.

Arizona English Language Proficiency Standards

ELL Stage IV
Basic
Comprehension of Oral Communications
Standard 1: The student will listen actively to the ideas of others in order to acquire new knowledge. The student will demonstrate understanding of oral communications by:
B-4 retelling the main ideas and key points/details of presentations.

ELL 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-4: answering who, what, where, when, why, which and how questions about text.
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-29: comparing and contrasting two items within an expository text.

ELL Stage IV
Basic
Writing
Standard 4: The student will integrate elements of effective writing to develop engaging and focused text.
The student will integrate elements of effective writing to develop engaging and focused text as demonstrated by:
B-1: writing text that incorporates details.
B-2: writing a paragraph, focused on a topic, that includes details, clear sequencing, and transitional words and phrases to connect ideas.
B-3: writing a paragraph using selected words that convey intended meaning.

Overview

Starting with the earliest civilizations, cultures have been using different modes of transportation to move goods and people. With advancements from these early civilizations, transportation has not only changed drastically over the years, but has also improved enough to be used in daily life. It is important for students to realize that certain aspects of life which seem "new" and "cool" actually have ties back to ancient civilizations.

Purpose

In this lesson students will learn the importance of conserving resources, and the different types of resources in the world. They will learn the method and practices that engineers go through when designing objects. Finally, students will be asked to work as a group of engineers by following the engineering design model to design the most stable and fastest invention that does not use gasoline or electricity to navigate the Nile River.

Key Vocabulary

non-renewable resource: Natural resources that cannot be replaced or grown at a rate to meet demand (fossil fuels, metals, and minerals)

renewable resource: any natural resource that can be replaced naturally with the passage of time (forests, air, animals)

renewable energy: energy that can be supplied continually (wind, solar power, geothermal, hydropower)

sailboat: boat that uses the wind to make it move

parts of a boat: mast, deck, keel, rudder, tiller, boom, sails

deceased: no longer alive

solar: relating to the sun

Materials

- Computer with internet access and LCD projector
- Wind Power As an Energy Source article
- What is a Solar Boat? article
- Article Summary Sheet
- How a Sailboat Works
- Color copies of Ancient Egypt map or project a map of Ancient Egypt
- Using the Engineering Design Process
- Materials for building inventions: note cards, cardboard, straws, scraps of cloth, paperclips, Styrofoam, card stock/construction paper, glue, rubber bands, etc.
- Tub/bucket of water

- Electric fan to create wind
- Vocabulary Test and Answer Key
- Ruler
- Stopwatch
- Social Studies Assessment on Egypt and Answer Key

Objectives

The student will be able to:

1. describe ways ancient civilizations traveled over water in the past.

2. describe ways that human dependence on natural resources influences economic development, settlement, trade, and migration.

2. analyze different ways to engineer a boat that stays afloat and travels the farthest.

Procedures

Prior Knowledge: Students have been studying ancient Egypt. This lesson would come toward the end of the study.

SESSION ONE

1. **Engage:** Show the 3 minute National Geographic video called "Energy: Alternative Energy". Access the video with this link: http://video.nationalgeographic.com/video/environment/energy-environment/alternative-energy/ Discuss the key concepts and vocabulary used. **(Integrating Processes: Listening**)

2. **Explore:** Show the map of Ancient Egypt. Ask students to name several ways that people traveled many years ago in Egypt. (riding animals, boats, chariots pulled by animals, carried by people, etc) Which of these ways seems the easiest in terms of energy? Which requires the least amount of work? What routes seem obvious for traveling? (Nile River, Mediterranean Sea, and Red Sea) Why would people live along the Nile? Why would people live along the seas? **(Preparation: Linking to past learning)**

3. **Explain:** Pair students. Have one student in the pair read Wind Power As an Energy Source while the other student reads What is a Solar Boat? **(Integrating Processes: Reading) (Grouping Option: Partners)** Once both partners are done reading his/her article have them share orally with their partner what they learned from their article. Once this is done, have them fill out the Article Summary Sheet for both articles. **(Application: Promotes Engagement) (Integrating Processes: Speaking and Writing) (Assessment: Individual)**

4. Create a word wall with the words that were not understood in the two articles as well as the words from the video shown earlier. **(Scaffolding: Comprehensible input)**

5. In any time left, have the students play a game to begin learning the vocabulary words on the wall. **(Application: Promotes Engagement)**

SESSION TWO

1. **Diagram/Elaborate:** Pose the question: What is the best way to travel on the Nile River in Egypt and not use gasoline or electricity?

2. Pass out the diagram How Sailboats Work. Have each group complete the questions on the paper. Encourage groups to incorporate some of the ideas from How Sailboats work into their designs. **(Scaffolding: Comprehensible input)**

3. Place students in groups of 4. Pass out the Using the Engineering Design Process worksheet. Explain that they will work as a group to design an invention that would travel the farthest, the fastest, and still hold together. Have the students complete the design worksheet and make their model. **(Grouping Option: Small groups) (Application: Hands on)**

SESSION THREE

1. **Evaluate:** Each group will test their boat in water provided with the fan providing wind. Allow students to measure the distance traveled using the ruler and how fast the boat crossed the tub. Then have the groups compare the inventions for stability (staying upright) and not falling apart. **(Grouping Option: Small groups) (Application: Hands on) (Assessment: Group)**
2. Have groups return to evaluate their success by completing the chart on the worksheet.
3. Allow time for students to re-engineer their inventions. **(Grouping Option: Small groups) (Application: Hands on)**

4. End the day by adding to the word wall especially the terms for parts of a boat. **(Scaffolding: Comprehensible input)**

SESSION FOUR

1. Review the question: **What is the best way to travel on the Nile River in Egypt and not use gasoline or electricity?**

2. Test the re-designed inventions with the same criteria from #1 above. Students will then complete the final question on the Using the Engineering Design Process worksheet. **(Assessment: Written)**

3. Students will complete the Social Studies Assessment on Egypt.

Assessment

Students will score 4 or higher on the 6 Traits Writing Rubric for the Article Summary Sheet in the area of ideas and content. **(Assessment: Written and Individual)**

Groups will be given participation points for completing the Using the Engineering Design Process worksheet and for working cooperatively. **(Assessment: Group)**

Students will score 80% or higher on the Social Studies Assessment on Egypt. **(Assessment: Written and Individual)**

Students will score 80% or higher on the Vocabulary Test. **(Assessment: Written and Individual)**

Extensions

Have students power their inventions by solar cells.

Have students design non-water modes of transportation.

Compare Egyptian boats to boats in other ancient civilizations.

Sources

Resources Vocabulary definitions:
www.epa.gov/greenhomes/TopGreenHomeTerms.htm

Parts of a Sailboat:
http://adventure.howstuffworks.com/outdoor-activities/water-sports/sailboat1.htm

National Geographic Society
http://environment.nationalgeographic.com/environment/global-warming/wind-power-profile/

Science and Public Policy Institute
http://sppiblog.org/

Egyptian Monuments:
http://egyptsites.wordpress.com/2009/02/25/the-solar-boat-museum/

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http://egyptsites.wordpress.com/2009/02/25/the-solar-boat-museum/

Nile Map
http://www.lib.utexas.edu/maps/historical/shepherd/mycenean_greece_orient.jpg

Zahi Hawass
http://www.drhawass.com/blog/uncovering-second-solar-boat-great-pyramid-today