

To The Rescue: Simple Machines

Author Heather Jones
Grade Level 2
Duration 5 class periods

National Standards

GEOGRAPHY

Element 1: The World in Spatial Terms

1. How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information.

Element 5:

Environment and Society

14. How human actions modify the physical environment

AZ Standards

ELA

Reading

Key Ideas and Details

2.RI.2 Identify and explain the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text.

Writing

Text Types and Purposes

2.W.2 Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.

Arizona Social Science Standards

GEOGRAPHY

The use of geographic representations and tools help individuals understand their world.

2.G1.1 Use and construct maps, graphs, and other geographic representations of familiar and unfamiliar places in the world; and locate physical and human features.

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

2.G2.1 Explain how weather, climate, and other environmental characteristics affect people's lives in a place or region being studied.

2.G2.2 Describe how human activities affect the communities and the environment of places or regions. **Examining human population and movement helps individuals understand past, present, and future conditions on Earth's surface.**

2.G3.1 Explain why and how people, goods, and ideas move from place to place.

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

Stage II

Basic

Listening and Speaking

Standard 1: The student will listen actively to the ideas of others in order to acquire new knowledge.

B-2: responding to read-alouds (fiction and nonfiction) by identifying main ideas and supporting details in complete sentences.

B-6: following multiple-step directions for classroom and other activities.

B-7: responding to academic questions using key words and phrases.

Standard 2: The student will express orally his or her own thinking and ideas.

B-5: asking and responding to academic questions using complete sentences, with instructional support. (i.e., who, what, where, when, why, how) (e.g., making comparisons and describing events, etc.).

Reading

Standard 4: The student will analyze text for expression, enjoyment, and response to other related content areas.

B-3: answering questions (yes/no, who, what, when, which, where, why) about text with instructional support

Overview

Columbia University Earth Institute estimates that plastic bags take about 20 years to decompose. Plastic bottles take up to 450 years to decompose. Students need to understand what the consequences are of plastic waste polluting oceans and how they can contribute a solution to the problem.

Purpose

In this lesson, students will learn how plastic toys, accidentally dumped in the ocean, have traveled to faraway places. They will use geography skills to map the ducks and then engineer a solution to this real-world problem. This lesson has adaptations for diverse learners (ELLs).

Key Vocabulary

conserve: to use carefully and to take care of

environment: the area around us

pollution: when too much of something makes an area dirty or unsafe

ocean current: a steady movement of water in the ocean

engineer: to plan and make something

machine: a combination of parts that makes it easier or faster to do a desired job

Materials

- To the Rescue: Simple Machines student packet that includes:
 - To The Rescue title page
 - Oceans, Conservation, and Engineering
 - Plastic Ducks and Bath Toys: Are They a Problem?

- World map
- The Engineering Design Process
- Vocabulary Practice
- Simple Machine Match
- Group Presentation of Simple Machines
- Basic Lego bricks or other markers (five for every student)
- Too Much Plastic in the Ocean powerpoint
- Vocabulary Cards
- World atlas or globe
- Colored pencils or crayons
- Scissors
- Glue
- Simple Machines Lego education kits- enough for every pair or group of students (see Sources for list of alternative materials)
- Vocabulary Test and Answer Key

Objectives

The student will be able to:

1. Read a nonfiction text and explain the problem in the text.
2. Locate places on a map.
3. Explain what happens when plastic gets into the ocean.
4. Design and build a machine or tool to solve the problem.
5. Give an oral presentation.
6. Define vocabulary related to oceans and simple machines.

Procedures

Students should have been introduced to simple machines previously. Students may need prior knowledge on how to read a map for them to be successful. Some students may not have access to

To the Rescue: Simple Machines

Legos at home and should be allowed time to play with and explore them prior to the lesson.

SESSION ONE

Engage

1. Begin by asking students "How often do you use plastic?" Share out responses. Then ask, "What do you do with plastic when you don't need it anymore at home? at school? When you're on a trip?" Share out answers.
2. Pass out the packets. Have students put their names on the front cover and then turn to the next page. Then ask, "What do you know about oceans and sea life? Allow them to think-pair-share. Then, discuss as a whole class what they know. As students share answers, write their responses on the board and instruct the students to write the same responses in the *Know* column. **(Preparation: Linking to background and Linking to past learning, Scaffolding: Comprehensible input)**
3. Project the Too Much Plastic in the Ocean powerpoint. Ask students, "What do you think when you see these pictures? How do they make you feel?" Allow students to think-pair-share ideas. While discussing the pictures, use the lesson vocabulary words in conversation. Explain the meaning of the words and distribute the Vocabulary Cards if necessary. **(Preparation: Strategies Used)**
4. Display the simple machine pictures and discuss each one. Inform students that they will be building their own machines or tools later on and it is important to understand these basic machines.
5. Read out loud the story Plastic Ducks and Bath Toys: Are They a Problem? based on the factual account of the toys being dumped overboard. To reinforce the story, you can show the powerpoint again as the story is read to give illustrations for shipping containers etc. Explain the bolded vocabulary words as you read. Discuss the story and what the problem is. Ask students, "what is/are the problem(s) in the story?" (the toys spilled, there is too much plastic in the ocean, the toys are stuck in the ocean, etc). Ask, "what are the consequences of this, or why is it a problem?" **(Integrating Processes: Reading and Listening, Application: Linked to objectives)**
6. Have students complete the Wonder column of the Oceans, Conservation, and Engineering as a culminating activity for today.

SESSION TWO

Prior to SESSION TWO: Label each grid box on the left side of the map vertically with letters A-J (and on the right side if you choose). Next, label each grid box on the top horizontally (and bottom if you choose) with numbers 1-18. This should be done prior to printing to save time.

Explore

7. Have students find the World map in their student packets. Project a copy of the World Map or a large map of the world for the class to see. Review how to find a location by using the grid. Do a few practices. Then, read the name of each ocean and continent labeled on the map. **(Scaffolding: Modeling, Application: Linked to Objectives)**
8. Explain to the class that they will be using Lego blocks to map where the toys went overboard and where they have traveled since the spill. As a location is mentioned, each student will place a Lego block in the appropriate place on the map grid. Model for students how to map using a grid the first location of where the toys spilled. (Eastern Pacific Ocean E,1) **(Scaffolding: Modeling)**
9. Then call out one location at a time for students to mark on their maps with Legos. Most students may not know where countries are. Guide them by also stating the continent and showing them on the projected map. **(Grouping option: Whole class)**
(Alaska C,2)
(South America F,5)
(Maine and Massachusetts C,6)
(England C,9)
10. When all of the locations are found, have students remove the Legos one at a time and put an X on each location.
11. Conclude the session by having student review the vocabulary words by completing the Vocabulary Practice.

SESSION THREE

Explain

12. Begin today by asking students what they remember from yesterday. Ask, "What is the problem from the story? Why is it a problem?" **(Application: Meaningful)**
13. Ask students, "How do you think you can help solve this problem? Think about what could we do to get them out of the water? And if we don't get them all, what are the consequences?" Ask, "what types of tools or machines might we be able to use?" Have students find The Engineering Design Process pages in their student packets.

To the Rescue: Simple Machines

14. Tell students “Today, you will design and begin to build machines or tools to solve the problem of the plastic in the ocean.” Guide students to plan out their simple machine/tool. What will it look like? How will it work? What materials are needed? Why do you think it will work?
15. Instruct students to turn to “The Engineering Design Process” page in the student packet. Read each question aloud to the students as they work through Steps 1-4: Ask, Imagine, Plan, and Create. Provide sentence frames or sentence starters as needed. Allow 10-15 minutes for students to fill out the sheet.
(Scaffolding: Guided practice)

Elaborate

16. When finished with the planning, students will share their design with their group. Students will choose one of the designs created from one member of their group to build. This will be their group machine/tool project. **(Grouping option: Small groups)**
17. Now instruct students to turn to the matching worksheet. Have students cut out the pictures of the simple machines. Read off the names of each machine listed and allow for students to individually match them up and glue them down. This will serve as a knowledge checkpoint of simple machines. **(Assessment: Individual)**

SESSION FOUR (30 minutes)

18. Announce that today, the groups will build their machines or tools that will solve the problem of plastic in the ocean.
19. Discuss and set clear expectations for building with the Legos. Then, distribute one Lego kit to each group. Tell students that only one person should be building at a time (the builder). Each person will have 3-5 minutes to build the machine or tool at one time and the other group members will be expected to instruct the builder what to do. When time is up, the next person will become the builder. This pattern will continue throughout the building process. Allow at least 30 minutes for students to build their design and complete Step 5 of “The Engineering Design Process”.. **(Application: Hands on, Grouping option: Small groups)**

SESSION FIVE

20. Begin class today by explaining that each group will be sharing their machine/tool with the class. Write on the board the following expectations for each presentation:

- Describe what your invention is. Does it have a name? What does it do? How will it solve the problem?
- Was it easy to design? Was it easy to build?
- What was challenging about the process?
- What would you do differently next time?
- Each member of your group should have a chance to speak.
- Speak clearly and slowly.
- Speak loud enough for all to hear.
(Assessment: Oral, Integrating Processes: Speaking and listening)

Evaluate

21. After the groups are finished constructing their machines/tools, explain the Group Presentation of Simple Machines rubric and allow five minutes for each group to give their presentation.
22. Then instruct students to turn to the Oceans, Conservation, and Engineering chart and fill out the *Learn* column as you write responses on the board. Ask, “What did you learn about oceans? About conservation? About engineering?” Students should write at least three things they learned. **(Application: Linked to objectives)**
23. Conclude the lesson by discussing any further questions or observations made. Pass out the Vocabulary Test to each student. Students will match each word to the correct definition. After each student is finished, they should turn in both the test and their packet. **(Assessment: Individual and written)**

Assessment

Geography

Mastery will be considered 80% or higher on locating the sites of the ducks being in the ocean.

Geography and Science

Mastery will be considered 80% or higher on the correct answers and the completeness of the student packet.

Science

Mastery is considered 100% or higher on the Simple Machine Match to assess recognition of the machines.

Reading and Writing

Mastery will be considered 80% or higher on the correct answers and the completeness of the student packet.

To the Rescue: Simple Machines

Mastery will be considered 16 points or higher on the rubric to grade oral presentations.

Mastery will be considered 80% or higher on the Vocabulary Test.

Extensions

Give each student a toy or paper duck. Have students map where their individual ducks have traveled for the last week/month on a paper map of the community or use Story Mapping as a digital tool. Have students graph the locations that the ducks visited the most. Math problems could be generated from the data.

For explicit vocabulary reinforcement, read the short vocabulary passage on the vocabulary practice page with students. Go through each bolded vocabulary word using context clues to define each one. Allow 10 minutes for students to draw their own picture for each word on the worksheet. This may be done on day one pushing the story to day two, or may be done for homework or additional practice.

Rather than mapping on paper where the ducks went, students can use technology to map the locations using markers on MapMaker's interactive map <http://mapmaker.nationalgeographic.org/>

Plan a plastic and garbage cleanup campaign at your own school and let students lead the campaign.

Sources

A brief video explaining background to the story https://www.youtube.com/watch?v=_UjAxuSuLlc (4.59 min)

World Map from National Geographic MapMaker <https://www.nationalgeographic.org/education/mapping/outline-map/>

Hohn, Donovan. The great escape: The bath toys that swam the Pacific. February 12, 2012. <https://www.theguardian.com/environment/2012/feb/12/great-escape-bath-toys-pacific>

Clerkin, Ben. Thousands of rubber ducks to land on British shores after 15 year journey. June 2007. <http://www.dailymail.co.uk/news/article-464768/Thousands-rubber-ducks-land-British-shores-15-year-journey.html>

How plastic hurts animals

<http://www.onegreenplanet.org/animalsandnature/marine-animals-are-dying-because-of-our-plastic-trash/>

Approximate time it takes for garbage to decompose in the environment

<https://www.thebalancesmb.com/how-long-does-it-take-garbage-to-decompose-2878033>

Definitions sourced partially from

<https://kids.britannica.com/kids>

The New Picture of the Great Pacific Garbage Patch (7.27 min)

<https://www.youtube.com/watch?v=VxMATP5oRx4>

Boyan Slat: How the oceans can clean themselves

<https://www.youtube.com/watch?v=ROW9F-c0kIQ> (11.21 min)

Lego Kits

<https://education.lego.com/en-us/products/simple-machines-set/9689>

Printable coloring pages

<http://www.cool2bkids.com/duck-coloring-pages/>

Common alternative materials to use if no access to Lego kits

- Cardboard
- Plastic straws
- Toilet paper or towel rolls
- Small boxes (paper clip box, matchbox)
- Pom poms
- Tape
- Glue
- Rubber bands
- String
- Scissors
- Pipe cleaners
- Clay
- Toothpicks
- Popsicle sticks
- Wooden dowels
- Safety pins
- Paperclips
- Plastic spoons
- Cardstock paper
- Construction paper
- Plastic lids to cut shapes or circles
- Styrofoam
- Stapler