Title: How Big Is A Tanker?

By Belle Mickelson

Theme: We need creative solutions to the challenge of safely transporting oil around the world.

Objectives:

- Students will form an opinion about double-hull tanker requirements.
- Students will understand why it is challenging to transport oil.
- Students will design their own tanker and develop ideas for safer transport.

Duration: 120 minutes, can be divided into 3 days

Age Range: 4th-8th Grade

Materials:

- Articles from Anchorage Daily News about tanker safety features, or student access to archives (http://www.adn.com)
- Drawing or drafting paper
- Pencils
- Colored pencils
- Long measuring tape or piece of string marked to 967 feet and 166 feet
- Nautical Chart: Prince William Sound
- Tanker crewmember or SERVs employee as guest speaker (optional)

Background:

Measuring 967 feet, the Exxon Valdez was just a midsized tanker. At the time, the largest oil tanker in the world, the *Seawise Giant* was 1,504 feet. This tanker was retired and scrapped in 2010. Currently, there are four double-hulled supertankers that are 1,247 feet in length. These ships, the TI Africa, TI Asia, TI Europe and TI Oceania, were built in 2002 and 2003. Since the *Exxon Valdez* Oil Spill, issues of tanker safety have become very important. For example, some argue that if the *Exxon Valdez* had had a double-hull, the grounding on Bligh Reef would have punctured much fewer containers, thus greatly reducing the size of the oil spill in Prince William Sound.

Preparation:

Print out or identify articles about tanker safety for students to use. The articles "Exxon Valdez: Can it happen again?"

(http://www.adn.com/2009/03/21/731971/exxon-valdez-can-it-happen-again.html) and "Oil spill knowledge pays off years later" (http://www.adn.com/2009/03/13/722652/oill-spill-knowledge-pays-off.html) outline some of the safety features that were enacted after the oil spill. One safety feature, the requirement for two escort tugs was renewed in 2010. The following articles deal with this issue: "Escort tugs rescue drifting oil tanker" (http://www.adn.com/2010/01/17/1098141/escort-tugs-rescue-drifting-oil.html), "Support lawmakers for escort tug efforts" (http://www.adn.com/2009/08/14/899079/support-lawmakers-for-escort-tug.html), "Two tug tanker escort could become federal law_ (http://www.adn.com/2009/05/15/797490/two-tug-tanker-escort-could-become.html), and "Coast Guard bill mandates escorts for double-hull tankers" (http://www.adn.com/2010/10/11/1497060/coast-guard-bill-mandates-escorts.html).

Articles from the ADN archives include:
"Coast Guard toughens oil tanker requirements" (http://www.adn.com/evos/stories/EV272.html) and "Oil spill bill goes to Bush: (http://www.adn.com/evos/stories/EV292.html).

Introduction:

Ask students what are the biggest things they can imagine? Oil tankers are some of the largest ships and they carry a cargo that is very hazardous to our oceans, coastlines, and the people, plants, and animals that inhabit these waters and shores. Yet oil is one of our most valuable resources and one that all of us use daily. In this activity we will be studying one way that oil reaches our homes and schools - by tanker.

Activities & Procedures:

Ask students if any of them know someone who works on a tanker. If possible, have a crewmember from a tanker or SERVS employee (Ship Escort/Response Vessel System) come into the class to talk about their job and experiences. Show students pictures of tankers and their crews.

Take a piece of string and measure out the length of the *Exxon Valdez*, 967' long and 166' wide, on the playground. Is the tanker larger than your playground? Explain that tankers are so big, some crewmembers ride bicycles to get back and forth to their jobs. Role-play some of the crew duties on your playground tanker, such as navigating, driving the ship, cooking, cleaning, keeping the engines running, tying up the boat, and loading/unloading oil. Load up oil in Valdez and run the tanker down to Seattle or another port, then unload the oil and get ready to head back up to Alaska.

Trace the route of tankers from Alaska to the West Coast on a map of North America.

Show students how some tankers go through the Panama Canal and on up to the East Coast.

Divide students into groups of 3-5 and provide them with a copy of a Prince William Sound nautical chart, or load the charts on http://www.charts.noaa.gov/OnLineViewer/16700.shtml and http://www.charts.noaa.gov/OnLineViewer/16708.shtml. Ask students to plot their course through Prince William Sound, from the Valdez terminal to the Gulf of Alaska. Explain that they want to choose the shortest course (to save time and fuel) that is also safe. Tell students that the draft of their loaded vessel is approximately 80 feet, or about 13 fathoms. Use ShoreZone to examine some of the hazards to navigation in and around Prince William Sound http://alaskafisheries.noaa.gov/mapping/szflex/.

Look up marine weather predictions for the area through the National Weather Service (http://www.nws.noaa.gov/om/marine/zone/alaska/akcstmz.htm) and current ocean conditions at the Alaska Ocean Observing System (http://data.aoos.org/maps/sensors/#). Look at past records of the wintertime weather in the Gulf of Alaska. Ask students to imagine what it would be like to drive a 1,000 foot boat full of oil in 100 mph winds.

Conduct a class debate on tanker safety. Have the students read the articles in the Anchorage Daily News about safety features including single versus double-hulls and the requirement of two escort tugs. Encourage students to do additional research in the library. Have students prepare a written opinion about safety features and give each student a chance to share their opinion with the class. Moderate a debate on the topic.

Have students design and draw the ultimate tanker including safety features. Encourage creativity and brainstorm possible features for preventing or minimizing the impact of oil spills. Have students present their tanker to the class.

Wrap-Up:

Discuss how preventing oil spills is many times easier than cleaning them up. Ask students if they think transporting oil by pipeline is less dangerous than bringing it by tanker. In 1970-1973, as the idea for the Trans Alaska Pipeline System was being developed, Congress was trying to decide whether to run Alaskan oil by pipeline to Valdez and then by tanker to the West Coast and through the Panama Canal to the East Coast or by pipeline through Canada. The vote in the U.S. Senate was tied 50 to 50 and Vice President Spiro Agnew broke the tie vote, so the pipeline went to Valdez and then took the ocean route. Ask the students to explain in their science notebooks how they would have voted and why. At present, the United States and other countries are debating how to safely construct new oil pipelines. Explain that if we conserve energy, then less oil will need to be transported. Ask students to list 10 ways they can conserve energy today. Every little bit helps!

Evaluation:

Assess student understanding based on their completed navigational charts and contributions during the debate and discussions. Observe participation, cooperation and respectful tone during group work and debate. Their "ultimate oil tanker" design and written explanation in the science notebooks of their hypothetical vote serve as formative assessments.

How Big Is a Tanker?

Concepts of Earth Science: Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences.

SD3
Students develop an understanding of the cyclical changes controlled by energy from the sun and by Earth's position and motion in our solar system.

The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth's position and motion in our solar system by:

[3] SD3.1 using recorded weather patterns (e.g., temperature, cloud cover, or precipitation) to make reasonable predictions

Science and Technology: Students develop an understanding of the relationships among science, technology, and society.

SE1 Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events.

The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by:

[5] SE1.1 identifying a community problem or issue and describing the information needed to develop a scientific solution

[6] SE1.1 recognizing that technology cannot always provide successful solutions for problems or fulfill every human need

[7] SE1.1 describing how public policy affects the student's life (e.g., public waste disposal)

[8] SE1.1 describing how public policy affects the student's life and participating diplomatically in evidence-based discussions relating to the student's community

SE2 Students develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits.

The student demonstrates an understanding that solving problems involves different ways of thinking by:

[6] SE2.1 identifying and designing a solution to a problem

SE3
Students develop an understanding of how scientific discoveries and technological innovations affect and are affected by our lives and cultures.

The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by:

[3] SE3.1 listing the positive and negative effects of a single technological development in the local community (e.g., fish trap, fish wheel, four-wheeler, computer)

[8] SE3.1 predicting the possible effects of a recent scientific discovery, invention, or scientific breakthrough