

Developed by Participants in the 2007 [Great Lakes Maritime Transportation Summer Teacher Institute](#) sponsored by the Great Lakes Maritime Research Institute (www.glmri.org)

Keep Your Boat Afloat

Susan L. Katt
Pewaukee Lake Elementary
kattsus@pewaukee.k12.wi.us

Target Grade: Kindergarten Science/ Math

Lesson Overview:

In this hands-on, exploratory earth science lesson, students will investigate the properties of floating and sinking. Through experimentation, students will problem-solve the criteria for keeping a boat afloat carrying different weights (mass) of cargoes. This concept has a real-life application to the shipping industry. This fits into the K science curriculum when students study the properties of water using the five senses.

Objectives:

At the end of this lesson students will be able to:

1. Explain how they were able to keep their boats afloat using the two types of cargo.
2. Identify heavy and light cargoes.

Wisconsin State Performance Standards:

Science:

By the end of Grade 4 students will:

C.4.2

Use the science content being learned to ask question, plan investigations, make observations, make predictions, and offer explanations.

C.4.6

Communicate the results of their investigations in ways their audiences will understand by using charts, graphs, drawings, written descriptions, and various other means.

Math

By the end of Grade 4 students will:

A.4.3

Connect mathematical learning with other subjects, personal experiences, current events, and personal interests.

D.4.1

Recognize and describe measurable attributes, such as length, liquid capacity, time, weight (mass), temperature, volume, monetary value, and angle size, and identify the appropriate units to measure them.

Materials Needed:

Photo of Great Lakes freighter (from web or book)

Picture of the Mayflower

Per student

- One 8 oz. milk carton, cut in half
- 20 Taconite pellets or marbles
- 20 Pony beads (lightweight, plastic, ¼” diameter) – what are these and where do you get them?
- Handout: “Can Your Boat Float” (2 pages)
- Pencil
- Red and brown crayons

- Plastic dish tub or other plastic container with 3 inches of water in it (**is one enough?**)
- Towels or paper towels

Room Arrangement

The classroom is set up in centers. This activity will be the science center during weekly rotations of 2-3 students per center.

New Vocabulary:

Buoyancy – the power of a fluid to exert an upward force on a body placed in it

Cargo – goods carried by a ship

Float – to rest on top of a liquid

Freighter – ship for carrying cargo

Heavier – having a greater weight

Lighter – having less weight

Longshoreman – a person who works at a port loading or unloading ships

Sink – to go to the bottom

Taconite – refined iron ore shaped like a marble, a common cargo on Great Lake freighters

PROCEDURE

Attention-getter:

Show a picture of the Mayflower. The Pilgrims coming over on the Mayflower brought a lot of their belongings with them on the ship. Where on the ship would they put them? Could they put them anywhere they wanted? What could make a ship sink? Why? Do you think it matters where a cargo is placed on a big ship? What if a ship has to carry rocks and cotton balls? How do you think the longshore “person” who loads a ship would put the rocks and cotton balls on the ship? Do you think it makes a difference? In the science center this week, you are going to be a longshore”person”, who has to load a cargo, and keep your boat afloat.

Describe Instructions for Science Center (or Classroom) Activity:

In the science center this week, 2-3 children will participate in this activity at a time. Each student will have a milk carton, sliced in half, to be a “boat,” and a dishpan with three inches of water in it. Show a photo of a Great Lakes freighter. These big ships carry iron ore rolled into taconite pellets from Lake Superior (Minnesota and Michigan) to ports on Lakes Michigan and Erie to make steel used in making automobiles, and many other items in our homes.

Explain that the more cargo a freighter can carry the more money the owner/company will make. Their milk carton will be their freighter and their job is to load their boat with as many taconite pellets as possible until their boat begins to get tippy, or starts to sink into the water.

Ask the students how they might put the taconite pellets into the boat so that it doesn't turn over and sink. Demonstrate several strategies to keep the boat balanced. **(such as? Do you want to demo this now, or let students experiment first?)**

2

Students will put the taconite pellets into their boats one pellet at a time until it sinks. Students will record how many pellets were put into the boat when it sank on their handout "Can Your Boat Float." Students will conduct their experiment three times. After each time they will record their number of pellets on the record sheet. Have towels or paper towels available for clean up and/or dripping water.

Next, have students compare the weights of the taconite pellet and the pony beads. Which is heavier? Lighter?

Students will conduct the same experiment using pony beads. Record how many pony beads it takes to sink their boat on the handout "Can Your Boat Float." Students will conduct their experiment three times. Does it take more or fewer pony beads than taconite pellets to make the boat sink?

Finally, students will vary the arrangement of the two cargo placed together into the boat. Each freighter must hold 20 taconite pellets and 20 pony beads without sinking. Students will first diagram the placement of their cargo using crayons on the record sheet ---brown circles will represent taconite and red circles will represent the pony beads. Lastly, students will try their diagram and see if it works!

Students will put completed record sheets into basket on table and clean up area. Taconite pellets, pony beads, and boats will be put back into appropriate containers. All water on table or floor will be wiped up.

Assessment:

Using their diagrams students will explain to the teacher and/or classmates how they were able to balance cargo keeping their boat afloat.

Extensions:

Students can add other types of cargo or make and/or try other types of boats.

Resources:

Ardley, Neil. 1991. *The Science Book of Water*. Gulliver Books. London.

Foy, Elizabeth, editor. *Investigating Water*. Hudson: Delta Education, Inc., 1996.

Gibbons, Gail. *Boat Book*. New York: Holiday House, 1983.

Macdonald and Company. *Floating Things*. Danbury Press. 1977.

Robertson, Bill. "Science 101 – Q: How can an ocean liner made of steel float on water?"

Science and Children Summer 2007: 56-59.

www.boatnerd.com (complete reference)

Internet Source

Author's last name, author's first name. Title of document. Name of organization that posted the document. Retrieved on <date> from <website address>.

www.great-lakes.net/teach/business/ship/ship_2.html

www.media-seaway.com

Name _____

Can Your Boat Float?

How many taconite pellets could your boat hold?

Trials:

1. _____

2. _____

3. _____

How many pony beads could your boat hold?

Trials:

1. _____

2. _____

3. _____

Which cargo was heavier? _____


Which cargo was lighter? _____

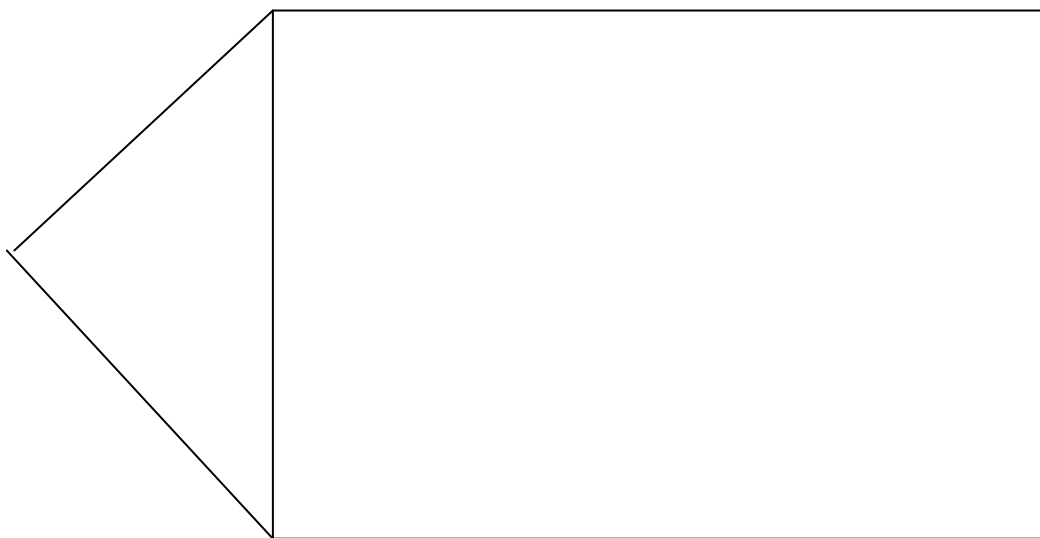
Why do you think that? _____

Now you are going to put 20 taconite pellets and 20 pony beads into the boat together. Draw a picture showing where you will place each of the cargo.

Show the placement of your mixed cargo in the boat.

Color the taconite pellets  brown.

Color the pony beads  red.



Did it make a difference where you put your cargo in the boat?

Yes No