



Coming to America

Activity 1: Grades 9-12

Building an Arctic Boat

An umiak (oo-mee-ak) is an open arctic boat that has been used since earliest times by the Inuit. Its frame is constructed of thin pieces of wood (called stringers) that are lashed together. This type of construction produces a flexible structure that easily withstands the force of crashing waves. The stringers are covered by seal or walrus skin. Known as a family boat, or "women's boat," the umiak has traditionally been used to transport all sorts of things, including weapons, clothing, people, dogs, sleds and tents.

This activity page will offer:

- A hands-on experience in shaping a model umiak hull
- An exploration of boat balance
- An understanding of how ballast helps keep a boat upright

Weighed Down

Not only does the umiak have a large carrying capacity, but it is also extremely stable. This stability arises from its shape and low center of balance. To further increase stability, rocks are placed in the bottom of the hull. In this activity, you'll observe how added weights can make a boat model less likely to capsize.

Materials

- Balsa wood
- White glue
- Tissue paper
- Clay
- Large nail or bolt
- Bowl filled with water

Procedure

Part One - Building the Model

1. Work in teams of two. Examine the frame of a model umiak shown here.
2. Use stringers of balsa wood and white glue to construct this model frame. Let dry.
3. When the frame has dried, cover it with tissue paper. Use a light coating of white glue to attach the paper to the frame. Let dry.
4. When the covering is dry, you can waterproof the paper by painting it with a very dilute solution of white glue. Let dry overnight.

Part Two - Exploring Stability

1. Place your model boat into a bowl filled with water. Observe how it floats.
2. Remove the model from the bowl. Secure a large lump of clay to one of the sides of the boat. Place the boat back in the bowl. What happens now?
3. Place a large nail or bolt in the bottom of the hull. How does this added weight affect the stability of the boat?

Questions

1. Although a block of aluminum sinks, the boat you shaped from aluminum foil floated. Explain.
2. What happened when the lump of clay was added to the side of the boat?
3. How did the extra weight placed in the bottom of the hull affect the boat?

Inquiry Extension

How does the amount of weight placed in the hull affect stability? Can you add too much weight? Develop a strategy for inquiry that would explore this variable. Share your design with your instructor. With your instructor's permission, perform your investigation.

Fictional Log

Think back to the earliest sailors of umiaks. Suppose you were a village elder who recorded the travels of this prehistoric band. Write a fictional account of your journey as you crossed the Atlantic Ocean along the edge of the polar ice sheet. Make sure that you create this essay through the eyes and understanding of an individual who lived more than 10,000 years ago!

Western and Eastern Versions

There are two distinct types of umiaks. The Western Arctic umiak is a streamlined slender boat often used in hunting. The Eastern Arctic umiak is a larger, bulkier boat used mostly in transportation of goods, homes and families. Research the differences in these boats and construct a model of each

type. Use these models to compare and contrast the differences in use and design.

Row, Paddle or Sail?

Prior to the advent of outboard engines, umiaks could be propelled in several ways. Depending on the situation, the boat could be rowed, paddled or sailed. Each type of propulsion had advantages and disadvantages. Compare and contrast these different ways of propelling the boat. What situations would warrant the use of each method? Which method of propulsion was best used to travel great distances? Why?

Web Connection

Umiak Construction and Form

<http://www.rockisland.com/~kyak/umicon.html>

The site offers an overview of umiak form and construction.

Good Old Boat: Is Your Boat Stable?

<http://www.boatus.com/goodoldboat/stability.htm>

This site offers an introduction to boat stability that explores the shape and design of typical sailboat hulls.

Native Watercraft: Umiaks

<http://www.civilization.ca/aborig/watercraft/wau03eng.html>

This site includes illustrations of different types of umiaks.

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ANSWERS

Part Two - Exploring Stability

1. Place your model boat into a bowl filled with water. Observe how it floats.
2. Remove the model from the bowl. Secure a large lump of clay to one of the sides of the boat. Place the boat back in the bowl. What happens now?
(The boat capsizes and sinks.)
3. Place a large nail or bolt in the bottom of the hull. How does this added weight affect the stability of the boat?
(It increases the model's stability.)

Questions

1. Although a block of aluminum sinks, the boat you shaped from aluminum foil floated. Explain.
(The design of the hull displaced enough water to produce a buoyant force that was greater than the weight of the boat.)
2. What happened when the lump of clay was added to the side of the boat?
(The boat became unstable and tipped over.)
3. How did the extra weight placed in the bottom of the hull affect the boat?
(It increased the model's stability, and the boat was less likely to tip.)