

W h a t F l o a t s
Y o u r B o a t ?



Teacher Packet
Grades K-8



Independence
Seaport Museum

W h a t F l o a t s Y o u r B o a t ?



Pre-Visit Lesson: Boat Builder Journal

Grades: 5-8

Objectives:

- 1) By creating their own boat builder journal, students will be able to document their own learning process by responding to and preparing for lessons in the boat building unit.
- 2) Students will be able to personalize their boat building experience by making a journal that reflects their own learning styles and interest in the subject matter.

Materials:

White paper (5 per student)
Construction paper (1 per student)
Brass nads/staples
Hole punch
Markers/crayons/pencils
Magazines
Boat Builder Images

Procedure:

1. Explain to students that they will be visiting Independence Seaport Museum for the *What Floats Your Boat?* lesson and will be learning the process of designing and building model boats at the museum and in the classroom.
2. Discuss what they already know about boats and if they have ever been on a boat before. (Remind students that ferry boats, paddleboats and canoes are all great examples of boats.) Use the images in the package to remind students of different kinds of boats.
3. Explain that they are going to create their own boat builder's journal that they will use throughout the unit. Pass out boat builder worksheet and five pieces of white paper that have been hole punched (or ask students to do it).
4. Make a cover using the construction paper and piece together the paper with brass nads or staple.
5. Ask students to decorate their journal by cutting out pictures of boats from magazines or using the sample drawings in the package.
6. Ask students to complete the boat builder worksheet. What is your favorite memory of being on a boat? If students have never been on a boat ask them to describe their favorite memory with water. (Remind students of beach vacations, trips to the pool, playing in the sprinkler in the backyard). Draw a picture of that memory. Ask students to share their drawings with the class.



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Boat Builder Worksheet

Student name: _____

Draw a picture of your favorite memory on a boat or with water.

What is happening in the picture? Write one or two sentences describing what is going on in your drawing.:

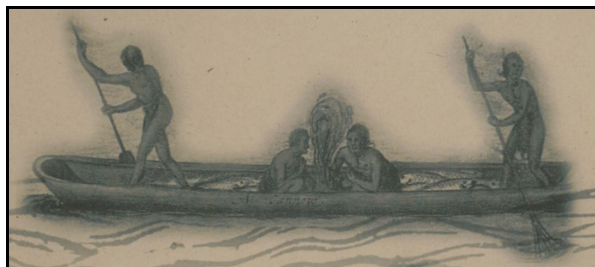


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Boat Builder Images



Dug out canoe



Sailing ship



Fishing boat



W h a t f l o a t s Y o u r B o a t ?



Pre-Visit Lesson: The Scientific Method of Hull Shape

Grades: 5-8

Objectives:

Students will be able to:

1. Define the terms buoyancy and displacement by testing the displacement of a clay bar.
2. Apply their knowledge of displacement by examining the hull shape of images of boats and deciding which shape displaces the most water.

Materials:

1 Aquarium tank	12-14 bars of clay
1 Plastic model boat	Penny
6-7 Clear plastic bowls/ buckets filled with water	Shipbuilding Challenge worksheets
and a long line of masking tape on each container	Pencils
Colored markers	

Procedure:

1. Toss a penny into a aquarium tank. Ask: Why does a penny sink but a huge ship made of steel floats? [Their shape and the way it is built makes it float.] The correct term for floating in shipbuilding is called **buoyancy**. When a boat is buoyant it means it floats. Why is it important for a boat builder to know if something floats? [If a boat doesn't float, it doesn't work]
2. Explain: Today you are going to do a scientific experiment to determine if clay can float. Boat builders are like scientists, they test different designs to see if they are going to work. You are going to test to see if clay is a good boat building material.
3. What are some of the steps in doing an experiment? Write down the steps on the chalkboard or large piece of paper.
 1. Come up with a question/Observe the data. What is happening?
 2. Classify the data. What are the possible relationships in what's happening?
 3. Make a hypothesis. Make a statement that you think accurately explains what you've observed.
 4. Conduct experiments to "test" the hypothesis.
 5. Form a theory about the results of the experiments and the hypothesis or a revised one. What happened, and why?
4. Explain: Today we are going to test the displacement of the clay using the scientific method.
5. Place the plastic model boat into the tank. Explain: When a boat goes into the water, the water doesn't disappear, it has to make room for that boat. If it is designed to float, it will push aside water to make room for that boat. Pushing aside water is called **displacing** water. You can remember that displace rhymes with replace. The boat is replacing where the water was. If the boat pushes aside the exact amount of water as the weight of the boat. It will float.
6. Ask: Does a penny displace water? [No. The penny cannot keep out water with its shape so it does not displace water. The object displaces water because it keeps out water.]
7. Explain: Now I want you to see if you can determine if these clay shapes displace water. Divide class into teams of three or four and pass out 1 set per team: 1 worksheet, 1 plastic container filled with water, 2 clay bars, markers (3 different colors), pencils. Go over instructions on worksheet and ask them to complete experiment.
8. After 10 minutes ask them to report on what they discovered in their experiment. What conclusions did they draw?

W h a t f l o a t s Y o u r B o a t ?



Pre-Visit Lesson: The Scientific Method of Hull

Extended Activity:

1. Ask students to remain in their teams.
2. Ask: Why is it important for boat builders to know if their boat displaces water? [A boat needs to float to work.] Do boat builders need to know whether one boat displaces than another? [Yes!]
3. Explain: When you combined the two bars of clay you increased the weight of the clay boat. By increasing the weight, you also increased the amount of water that is displaced. The larger the hull shape, the more water the boat displaces. Remember: displace rhymes with replace. The larger the boat, the more water needs to be replaced.
4. Boat builders actually can measure how much water a boat displaces. How much a boat displaces water can determine what a boat is supposed to do. Let's see if you can determine which hull shape displaces the most water and if you figure what these boats/ships do.
5. Pass out worksheets to the teams and go over the instructions. Ask students to share their findings with the rest of the class.

Answers:

Picture A: Duck hunting boat
Picture B: Lifeboat
Picture C: Steamship
Picture D: Fishing Boat

Order of displacement:

Steamship
Lifeboat
Fishing Boat
Duck hunting Boat

Conclusion:

A wider boat displaces the most water. TITANIC is the largest ship in the bunch and it displaced 66,000 tons of water before it hit the iceberg. The wider the boat, the more cargo a boat can carry and the more stable the boat's construction.

Shipbuilding Challenge Worksheet

Team members:

Question: In which shape will the clay displace the most water?
(Remember you will see the clay displacing water when the water level rises. The more the water rises, the more water the clay is displacing.)

Hypothesis: (What do you think will happen when you the clay bar into the water?):
We believe that:

Procedure:

1. Mark the level of the water on the tape on the outside of the container with the **black** magic marker.
2. Place the **green** bar of clay into the container of water. Mark the new level of water with the **green** marker on the tape.
3. What would make this clay bar float? Change the shape of the clay bar to make it float.
4. Record how you changed the shape.

5. Place the new **green** shape into the bowl of water. Mark the new level of the water with the **blue** marker on the tape.

Conclusion: In which shape did the water rise the most? The shape that made the water rise the most displaced the most water. Which shape displaced the most water?

Choose one:

___ **Green** bar ___ New **Green** shape

Why did this happen?:

6. Try combining two clay bars together into a shape that will float. Place new shape into the water and mark the level of the water with a red marker.

Which water level line rose the most? ___ Green ___ Blue ___ Red

Why did this happen?:

Team members:

Shipbuilding Challenge Worksheet—Extended Activity

1. Circle the name of the boats below
2. Put a number 1 next to the boat that displaces the most water.
3. Order the remaining boats in order of how much water they displace.



(This boat is 7 feet long and 2 feet wide)

Circle the name of this boat:

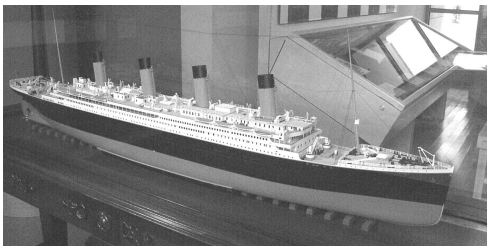
Life boat
Steamship
Fishing Boat
Duck hunting boat



(This boat is 27 feet long and 7 feet 10 inches wide.)

Circle the name of this boat:

Life boat
Steamship
Fishing Boat
Duck hunting boat



(This boat is 882 feet long and 92 feet 6 inches wide.)

Life boat
Steamship
Fishing Boat
Duck hunting boat



(This boat is 16 feet long and 5 feet wide.)

Life boat
Steamship
Fishing Boat
Duck hunting boat

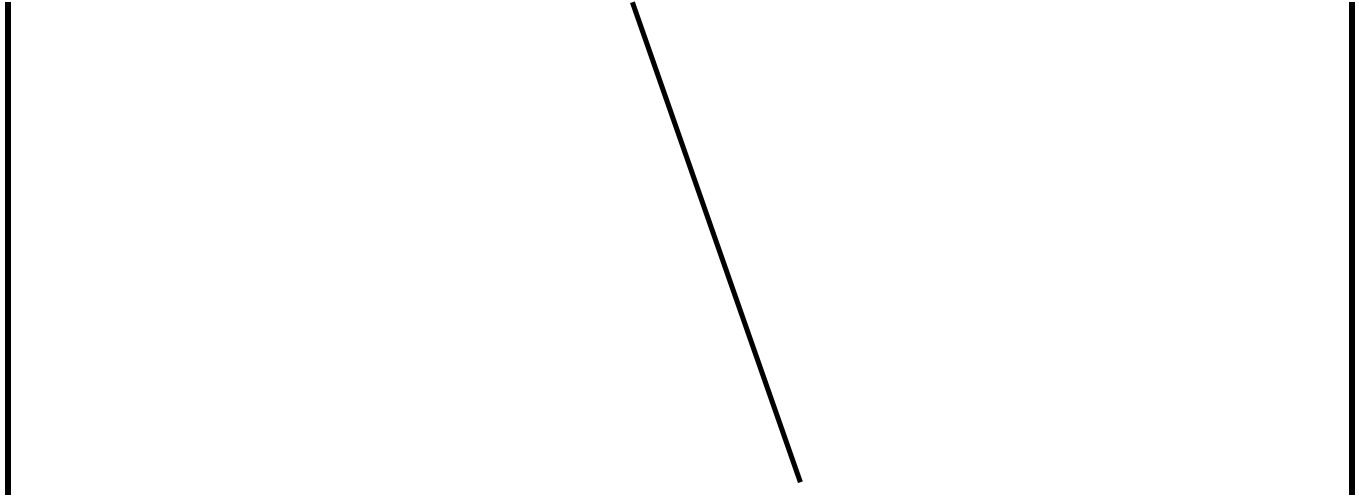
W h a t F l o a t s Y o u r B o a t ?

Make your own

Post Lesson Worksheet

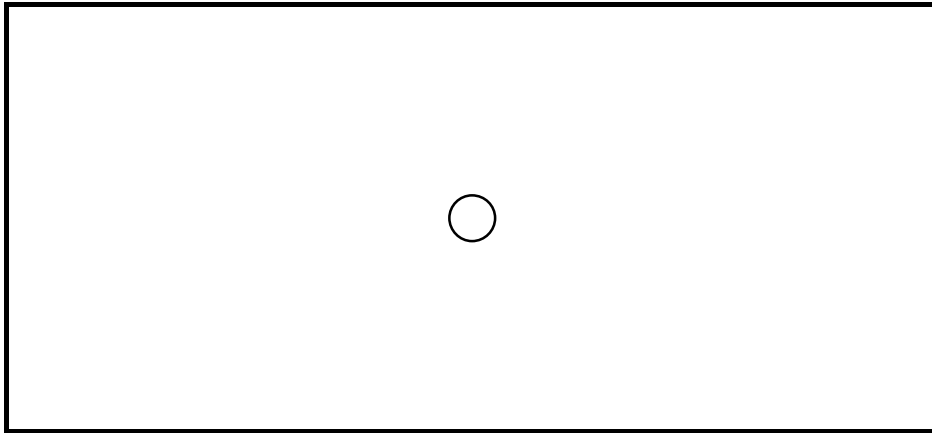


Chinese Junk



Mainsail

Foresail



Deck Cabin



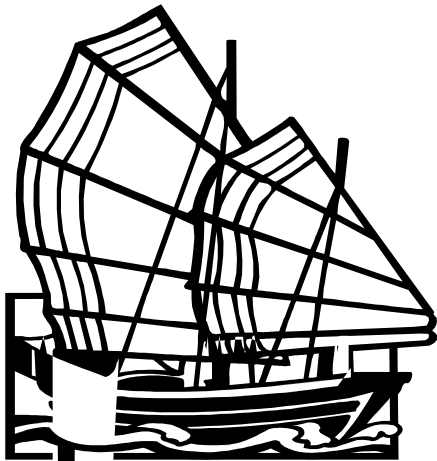
Hull (cut out
of foam)

Make your own

Chinese Junk



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The Story of the Chinese Junk

Most people throw junk away, but in Chinese the word “junk” stands for something very useful.

For centuries, Chinese sailors and merchants have used boats called **junks** to transport people and goods. The name “junk” is thought to come from the Chinese word for river, pronounced “jo”.

Junks are ancient. European explorer Marco Polo wrote of seeing junks during his journey to China in 1298!

Junks are made of wood with several sails. The sails have wooden sticks called battens sewn into them. The battens help the sail hold its shape.

In the past, junks had only sails to push them through the water. Modern junks also have engines to push them when the wind dies.

Junks are still used today in China and many countries in Southeast Asia.

Construction Materials

- Pre-cut foam hull, approx 6 1/2”x1”
- Wooden dowel, 6 1/4” long
- Wooden dowel, 5 1/2” long
- 8 wooden coffee stirrers, 2 1/4” long
- 2 Popsicle sticks
- 1 square foot blue tissue paper
- Bristol board base, 8”x6”
- Sail & Deck Cabin cut-out sheet

Other Supplies

- White glue
- Transparent tape
- Colored pencils
- Scissors
- Tempera or acrylic paint

Directions

1. Wrap blue tissue paper over Bristol board base and tape in place. Add waves with colored pencils.
2. Cut out and decorate Mainsail, Foresail, Deck Cabin and Nameplate from cut-out sheet.
3. Tape Deck Cabin in place on foam hull.
4. Tape Popsicle sticks along each side of hull.
5. Push masts into foam hull and glue in place.
6. Paint your junk with tempera or acrylic paints and let dry.
7. Glue coffee stirrer “battens” onto sails. Have an adult superglue your sails onto your masts.
8. Glue junk on base with white glue once your paint has dried and add your nameplate.

Congratulations, you’ve made your own Chinese junk!





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Chinese Junk Vocabulary Words

batten: a wooden stick sewn into a sail to help the sail keep its shape.

bow: the front of a boat

deck cabin: small shelter on a boat's hull for the crew and passengers.

hull: the part of a boat that sits in the water.

mast: a tall pole that supports the sails.

Marco Polo: famous European explorer who visited China in the 1400s.

rudder: used to steer a boat.

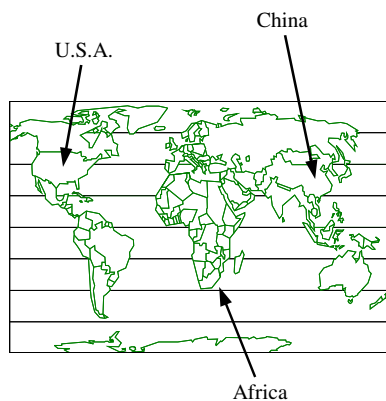
sail: large pieces of fabric that catch the wind to push a boat through the water.

stern: the back of a boat

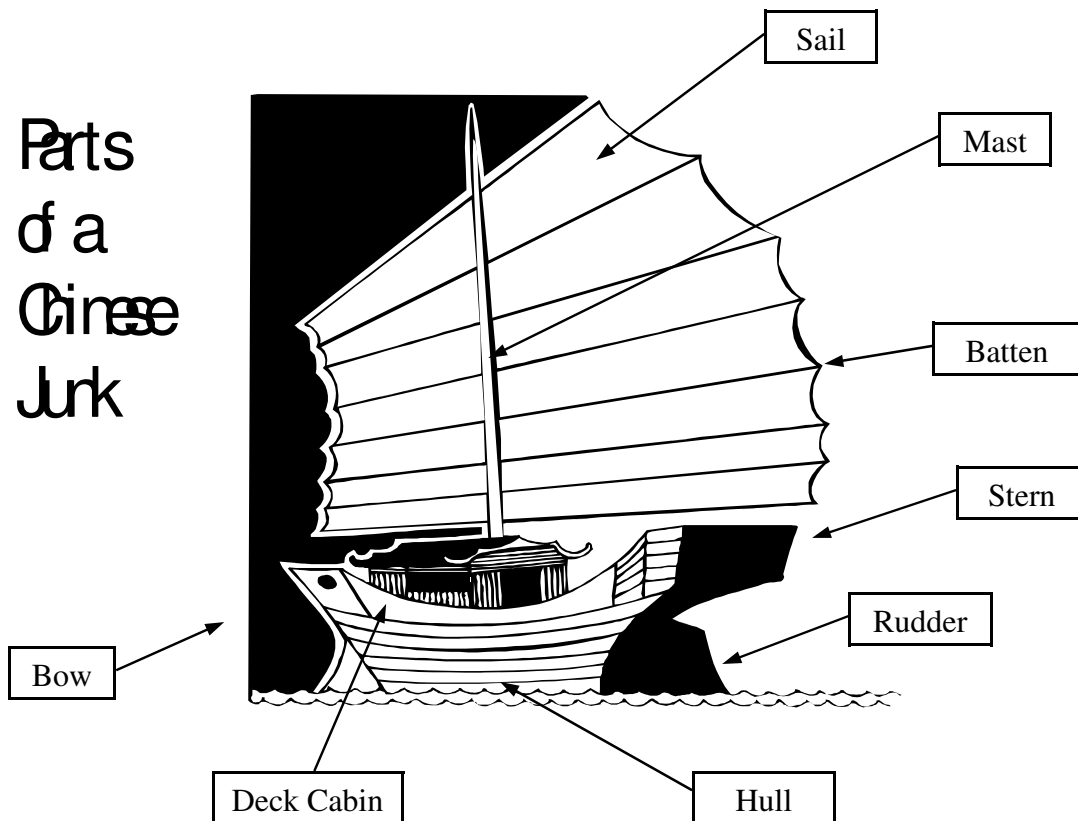
Did you know?



In the early 1400s—
nearly six hundred years
ago—the famous Chinese
explorer **Cheng Ho**
sailed from China to
Africa in a junk!



Parts of a Chinese Junk



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Resource Guide

Teacher Resources

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