



AMISTAD AMERICA LESSON COLLECTION

Reading Water

Grades: 7-12 Time Frame: 4-5 days

Overview

Sailors, fishermen, sea kayakers, life guards, surfers and other ocean-goers know how to "read water." Find out what they look for and why in this project. Even with modern instruments and a cabin full of charts, good water reading skills go a long way.

Learning Objectives

- Learn how to find and read a tide table. Understand what causes tides and why they change times.
- Learn how to read a nautical chart and why sailors use them.
- Explore how currents serve as ocean highways for humans, sea creatures, and pollutants. Understand the relationship between air circulation and ocean surface circulation.

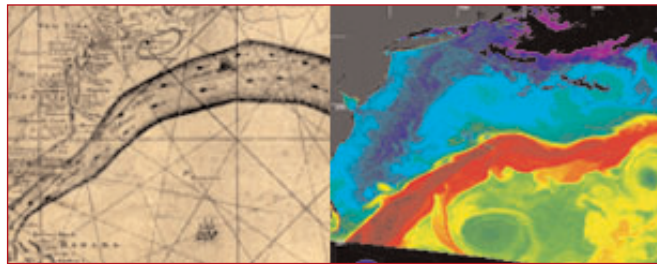


Chart of the Gulf Stream. Benjamin Franklin and Timothy Folger, 1768. Library of Congress
Satellite image of the Gulf Stream (Sea Surface Temperature), 2000. NASA Earth Observatory

Activities and Student Work

SHARPENING YOUR SEA SENSES

Over the years, sailors have developed many tools to help them navigate. Sophisticated software, water beacons, and satellite technology now tell them water depth, temperature, current speed, wind speed and weather conditions. Global positioning technology can tell them exactly where they are.

However, sailors have also counted on sharp eyes, ears, and noses to help them understand the waters around them. Start this activity by reading the website about Wayfinding, navigating without instruments. Make a list of all of the things Wayfinders use to navigate.

After you read, meet with 2-3 students to compare lists. Can you think of other navigational clues the ocean or skies might give sailors? Add them to your list. Think about each of your five senses, how sailors might use them, and what they want to know.

During your *Amistad* visit, ask crew members what water or sky tells them. If you take a turn on her, keep an observation log of things you notice while under sail.

SAFE HARBOR

The crew of Freedom Schooner *Amistad* has asked your class for advice on how to sail her into the harbor where you'll visit her. What will the tide be on the day that you visit Freedom Schooner *Amistad*? What harbor will you visit her in? What would the crew need to pay attention to as they sail her in and out of port?

Use your web resources to learn about tidal prediction and nautical charts. Then, find the tide chart for the harbor and day you'll visit the *Amistad* (or a nearby port that she could visit).

Prepare a one-page Captain's Briefing that answers these questions:

1. What are the best times for *Amistad* to enter and leave the harbor? She's coming in for maintenance and will dock for five days but will then begin daily sails the following week.
2. What is the best course into the harbor? Is there a channel in the harbor that the *Amistad* should use? If so, how deep is it at its deepest and shallowest points (at both low and high tide)?

Activities (continued)

SAFE HARBOR (continued)

3. Where is the shallowest part of the harbor? Are there any underwater obstacles? In other words, what should the captain watch out for?!
4. How much of a difference is there between low and high tide in the harbor? Approximately how many additional feet of rope would the crew need to use to keep her tied safely at both low and high tides?

Display important information in a data table. Explain each answer and any assumptions you make about the information you find in charts.

ON THE OPEN OCEAN

Sengbe and the African captives were on a short trip along the coast of Cuba, from Havana to Principe, when they took over the *Amistad* - a trip that would have lasted less than a week.

Two months and hundreds of miles later *La Amistad* ended up in waters off the Long Island Sound. How could Sengbe have known about the Gulf Stream, one of the Atlantic's strongest currents? You can bet that Montes and Ruiz, the two Spaniards piloting the ship, probably did - although they probably didn't understand it.

In fact, the surface of the Atlantic is constantly moving and there are plenty of telltale and scientific signs. The *Amistad* captives could have drifted in currents that would have taken them right back around to Africa. Or could they?

Use your web resources to investigate Atlantic currents. Find answers to the following questions:

1. What are the main currents of the North Atlantic? Where and how do they flow?
2. What did people originally think the currents were? What are they really?
3. Why do the waters of the North Atlantic move in the pattern they do?
4. Why is the Gulf Stream warm?
5. What happens when major North Atlantic currents meet each other? What happens when the Gulf Stream (warm) and the Labrador (cold) currents collide off the Grand Banks of Newfoundland?

SHOW THE FLOW

Now create a map and flow diagram that shows the pattern of North Atlantic currents. Your teacher may give you the option to create a poster or a slide presentation. In either case, label important characteristics of each major current and ocean features that cause transition points (where currents change or meet others).

Assessment

- Your list of non-instrument navigation ideas includes examples related to all five senses.
- Your Captain's Briefing includes accurate information from tide and nautical charts.
- Your North Atlantic currents map shows the four major currents of the North Atlantic. You use color and symbols to show current patterns clearly. Key or interesting features of each current are well labeled.

Reflection Questions

1. How can you measure an ocean current without a current meter?
2. The nautical charts you used are based on high tech methods of mapping ocean topography. How else might sailors know they are in shallow water or deep water?
3. What other phenomena might a sailor encounter where currents meet or collide? At the edge of major currents?
4. What do North Atlantic currents have to do with the high activity of pirates and privateers off the southeastern coast of the U.S., the growth of plantations in the South, and the slave trade?

Activities (continued)

SHOW THE FLOW (continued)

Extra challenge for older students: Use your web resources to find real-time data to illustrate the differences between currents; for example:

- Sea surface temperature/current temperature
- Current speed
- Approximate start and end of the current (latitude and longitude)
- Latitude where the current is strongest

Given what you learned, what might have happened to *La Amistad* had she drifted or followed the natural flow of North Atlantic currents? Where else might the ship have landed? What is the most likely place she would have ended up? When (how long)? Be ready to defend your answer in class, using your map to support your ideas.

Resources

- NOAA Tidal Predictions
www.co-ops.nos.noaa.gov/tide_pred.html
- MapServer - MapTech
<http://mapserver.maptech.com/>
- Nautical Charts - Virtual Voyages
www.virtualvoyages.net/sailingskills/lessong/charts.shtml
- Nautical Chart Symbols and Abbreviations
<http://chartmaker.ncd.noaa.gov/mcd/chart1/chart1hr.htm>
- Wayfinding
www.pbs.org/wayfinders/wayfinding.html
- History of Navigation - BoatSafe Kids
<http://boatsafe.com/kids/navigation.htm>
- History of NOAA Ocean Exploration
http://oceanexplorer.noaa.gov/history/history_oe.html
- The Gulf Stream - A River in the Ocean
www.coastalguide.com/bearings/gulfstream01.htm
- A Warm River in the Atlantic Ocean - Exploring Earth
www.classzone.com/books/earth_science/terc/content/investigations/es2403/es2403page01.cfm
- Oceans - Biomes of the World - MBGNet
<http://mbgnet.mobot.org/salt/oceans/index.htm>
- Currents of the Ocean - Windows on the Universe
www.windows.ucar.edu/tour/link=/earth/Water/ocean_currents.html
- Victor the Vector
www.ocean98.org/vict1.htm
- The Gulf Stream
<http://fermi.jhuapl.edu/student/phillips/index.htm>

Resources (continued)

- NASA Earth Observatory
<http://earthobservatory.nasa.gov>
- Physical Oceanography DAAC (Data Center)
<http://podaac-www.jpl.nasa.gov/>
- How to Read Sea Surface Temperature
www.thecoolroom.org/fishermen/fish_help_sst.htm
- National Buoy Data Center
www.ndbc.noaa.gov/
- Blank Map of the World - National Geographic
www.nationalgeographic.com/xpeditions/atlas/world/world-b.gif

About Amistad America

AMISTAD America, Inc. promotes relationships between races and cultures by acknowledging our common experience and encouraging dialogue based on respect. Freedom Schooner *Amistad* serves as a floating classroom, icon, and monument to the millions of souls broken or lost as a result of the Transatlantic Slave Trade.

www.amistadamerica.org