Ocean in Motion 1: Who cares? Sea Captains, Scientists and You!

A. Overview-- Who Cares?

1. The Ocean in Motion

In this program, students will learn why ocean circulation is studied. The major portion of this lecture will cover the historical aspects of the world before modern ocean circulation studies; exploration, trade, navigation, and communication. We will conclude by introducing the modern reason for studying ocean circulation, namely climate.

2. Contents of Packet

Your packet contains copies of the following activities:

I. Where in the world are you?
   a. Find your longitude line.
   b. Find your longitude and Greenwich Meridian Time.

II. Build your own Astrolabe.

III. The Communication Race.

B. Program Preparation

1. Focus Points

- Exploration and trade led to:
  a. the study of ocean circulation
  b. improvements in navigational equipment
  c. accurate cartography
  d. improvements in methods of communication
  e. concept of local time versus Greenwich Meridian Time (GMT).
- The modern reason for studying ocean circulation is to enhance our knowledge and ability to predict climate.

C. Showtime

1. Broadcast Topics

This broadcast will link into discussions on geography and global vegetation, history, communications, basic astronomy, and geometry.

a. Before Ocean Exploration

Approximately 3000 years ago, the Greeks and Egyptians believed the earth was flat. People living in various parts of the world did not know about the existence of other lands or cultures.

b. Exploration, Trade, and Navigation

By the 1400's, scholars believed the earth was round because of it's shadow on the moon, but this had not been proven. The hope of increased trade of silks and spices from Asia led Europeans to finance large sailing expeditions. The aim was to find new and faster routes to the East. This was the 'Golden Age of Exploration'. During this time, Columbus reached the Americas; Magellan first crossed the Pacific and reached the Philippines. Increases in the number of ships and lives lost at sea led to improvements in navigational equipment and mapping of the major surface currents that ships utilized for travel.

Follow-up activity: I. Where in the world are you?
II. Build your own Astrolabe.

c. Communication

There are two main reasons why communication methods improved. One reason is that people sailed to different parts of the world to settle, and they wanted to exchange news with their families and friends in their home country. The second reason was that sailors on ships needed to communicate with people on land and with other sailors on other ships. A very famous example of a failure in communication was during the sinking of the Titanic. The ships closest to the Titanic did not understand the Titanic's distress messages for help. The ships that did receive the SOS messages were too far away to help.

Follow-up activity: III. The Communication Race

d. Climate

The modern reason for continuing to study ocean circulation is because it has a major impact on the climate. Seasonal climatological events, such as hurricanes, are very important to understand. Currently, the El Nino event in the southern hemisphere has been crucial in the alteration of local weather patterns. These two areas of climate studies will be covered in the final lecture in this series.

D. Activities

I. Where in the World Are You?

Key Concepts:

a. Longitude lines run from North to South.

b. The Greenwich Meridian is the 0° longitude.

c. Local time is based on the longitude.

d. Connection between GMT and local time.

A. Find Your Longitude Line

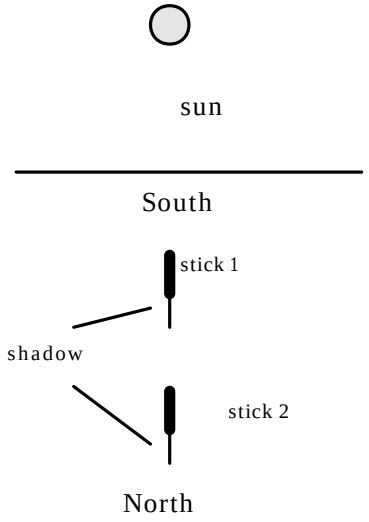
Materials:

- Two straight sticks - about 1 foot long
- Magnetic Compass
- Patch of bare soil or sand

Objective: To find a longitude line based on the position of the sun.

Method: Go outside to a sunny area of dirt or sand, just before noon. Drive the two sticks into the ground about 1 meter apart. When their shadows are in a straight line (Figure 1), the sun is passing at its highest point. The line of the shadows is your longitude line. Using your compass, line the arrows up with the shadows. It is a north-south line.

Figure 1: Finding a line of longitude



B. Find your Longitude and Greenwich Meridian Time

Materials:

- Map (or Globe)
- Clock

Objective: Find your longitude. Calculate the time at the Greenwich Meridian based on your longitude and local time.

Method: The earth turns 360° every 24 hours, so 15° of longitude pass under the sun every hour. On the map find the Greenwich Meridian (0° of longitude). Every 15° east of this meridian, time is increased by one hour. Every 15° west of this meridian, time is decreased by one hour. So, for example, if it was noon at the Greenwich Meridian and you were 30° east of it, your local time would be 2 p.m. If you were 30° west of it, your local time would be 10 am. On the map, find the longitude line closest to your location. Divide your longitude by 15°. This gives you the number of hours difference between your local time (during the summer) and Greenwich Meridian Time (GMT) (also called Universal Time, UT).

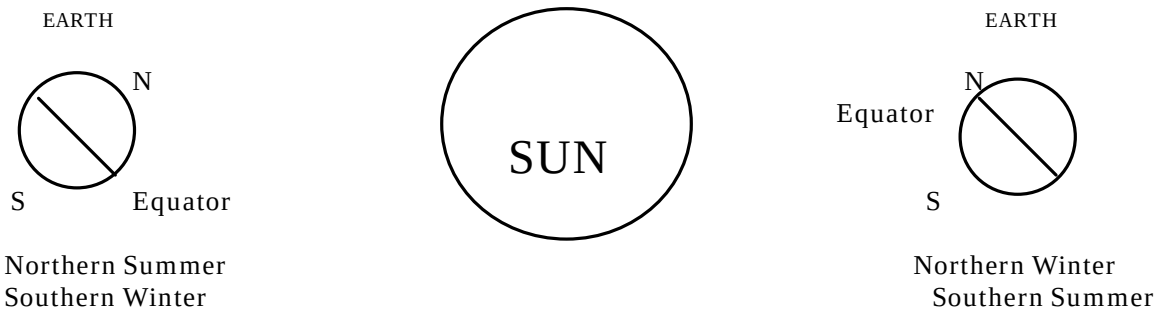
Classroom Discussion Questions:

1. **What would your time be relative to GMT if you lived at 180° longitude?**
2. **On the map, longitude lines are north-south. Latitude lines are east-west. What is the 0° latitude line called?**
3. **If it is summer time north of the equator, what season is it south of the equator?**
4. **From the map, what is your location in degrees latitude and longitude? Find the location of the Project Oceanography broadcasts in St. Petersburg, Florida.**
5. **Which country do your ancestors come from? What is the approximate longitude and latitude of that country?**

Teacher's Guide for Discussion Questions:

1. The time will be 12 hours different from GMT. If your students are familiar with the various 'times' you may want to discuss Daylight Savings Time. This is a complicated concept, because although the lines of longitude do not change, and Greenwich Meridian Time does not change, local time does.
2. The 0° latitude is the equator.
3. In the Southern Hemisphere it will be winter if it is summer in the Northern Hemisphere. You may have to explain 'hemisphere' to the students. We have seasons because of the tilt of the earth as it travels in it's orbit around the sun (Figure 2).

Figure 2: Northern and Southern Hemisphere Seasons



4. These answers will vary slightly. St. Petersburg, Florida is at about 28°N, 83°W.
5. The answers will vary depending on the student's ancestry.

II. Build Your Own Astrolabe

Where Are You, Star?

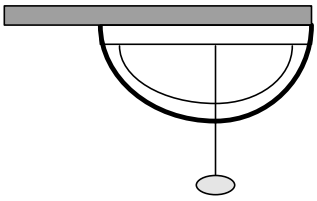
Build an **ASTROLABE**. An Astrolabe is an instrument that sailors used a long time ago to help them find their position on the sea by looking at the stars.

Materials:

- protractor, or half circle of cardboard
- piece of string
- a nut or washer
- a straw
- adhesive tape
- pencil or pen

Getting Started:

1. Mount straw along edge of protractor or half-circle with adhesive tape
2. Hang piece of string with nut or washer attached, from the center of the protractor, or half-circle. Mark number of degrees, if using a half-circle of cardboard.
3. Your ASTROLABE is now completed.



Now, use the **ASTROLABE**.

4. Sight moon, or stars, through straw.
5. Press string against the astrolabe, and hold.
6. On the Astrolabe, read the number of degrees the celestial body is above the horizon.
7. Be sure to subtract from 90° as you are using the protractor upside down.

Teacher's Notes:

The Astrolabe is a useful instrument to study the lunar cycle. Sight the moon every evening for at least one month. Carefully record the time of day, the moon's position, size and shape.

III. The Communication Race

Adapted from the National Science Foundation leaflet: Get the Message

Key Concepts:

a. Communicating is important.

b. There are many ways of communicating.

c. Learning to use the Morse Code.

Materials:

- Morse Code Alphabet Sheet (see below)
- Flashlights
- Pencils
- Pads of paper
- Desks

Morse Code Alphabet Sheet:

Morse Code

A	·–				N	–·				
B	–···				O	–––				
C	–·–·				P	·––·				
D	–··				Q	––·–				
E	·				R	·–·				
F	··–·				S	···				
G	––·				T	–				
H	····				U	··–				
I	··				V	···–				
J	·–––				W	·––				
K	–·–				X	–··–				
L	·–··				Y	–·––				
M	––				Z	––··				

Objective: To communicate with each other using the Morse Code.

Method: Give every student a copy of the Morse Code Alphabet Sheet. Divide the class into groups of two students. Give each team a flashlight or a pencil. They can communicate with each other using the Morse code, by long or short flashes of light. An alternative would be to tap a pencil lightly on a table. Once the students have mastered simple words or phrases such as "S.O.S.", "Hello", "Bye", set up teams of students to relay a secret message (that you have given them) from one group to the next. Each group has two students - a "decoder" and a "sender". Have more than one team and see which group solves the code.

Classroom Discussion Questions:

1. Morse Code is one way of communicating. Can you think of any other methods?

2. Why do we use codes to communicate?

Teacher's Guide for Discussion Questions:

1. There are many ways of communicating. The most obvious answers would be talking, reading and writing. People without sight use Braille. People without hearing use sign language. There are subtler methods, such as acting, or using facial expressions. Technology has increased the number of ways of communicating. We use radios, telephones, televisions, movies, faxes, and computers to name a few.

2. Codes are used when:

a. The distance is too large to communicate by sound. For example, a flashlight can send a message that can be seen miles away (if the light is strong enough).

b. It is simpler to send messages by code. For example, SOS messages are easy to send and understand. Signs are also a form of code, and are usually simple, such as a one-way street sign.

c. When secrecy is required. Many different codes are used by agents and spies.