Climate 101 Week 3

Third Group of *OSS* Unit 1 Sessions

Overview of the Week

* Use simulations and hands-on activities to investigate the roles of temperature and salinity in ocean circulation, and to connect these variables with differences in density.
* Summarize the cause (uneven heating of the planet), mechanism (convection currents), and effects of the Great Ocean Conveyor Belt (local currents, movement of heat energy globally from the tropics toward the poles).

Before Teaching this Week:

* Get materials needed for Sessions 1.5, 1.6, 1.7 and 1.8, and practice the labs and simulations. Simulation for 1.6 is Density of Liquids. Simulation for 1.8 is Model Oceans animation.
* Download from the OSS Resource Disc the slides in Unit 1 for Sessions 1.5, 1.6, 1.7 and 1.8. Be prepared to project these slides as needed.
* Review the four Sessions in the Teacher's Guide.
* Make enough copies of Handouts from Copymaster Unit 1 (CM1) from OSS Resource Disk pages 24 through 27 for Session 1.5 Mystery of Floating Balloons; pages 28 through 34 for the Model Ocean Stations in Session 1.7; and page 35 for the Great Ocean Conveyor Belt Homework in Session 1.8.

Day 1:Session 1.5: Mystery of the Floating Balloons

* Make enough copies of Handouts for Session 1.5 group work of Copymaster 1 (CM1) Unit 1 pages 24 through 27 from OSS Resource Disc.

Do the main investigation as written.

NOTE: One extra thing you can try is having different concentrations of NaCl solutions. A solution of 15 grams NaCl/liter sinks at room temperature. If the solution in the balloon is heated, then when the balloon is immersed in room temperature bath, it floats at first but then sinks as it cools. Twice as concentrated (30g/liter) sinks cold or hot. At 6 g/liter it has same behavior as 15g/liter but sinks slower on cooling. At 1.5 g/liter it floats at room temperature, sinks when cold but then rises to the top as it warms. Your results may vary depending on local conditions, but generally same principles will apply.

These would be great examples for participants to make predictions, gather data, and explain what is happening. If there are advanced students, a better challenge would be to give then the more concentrated solution (30 grams NaCl/liter) and see if they can come up with situations where the balloon first floats but then sinks (initially hot medium concentration of salt) or first sinks but then floats (initially cold dilute concentration of salt).

Day 2: Sessions 1.6 and 1.7: Balloon Simulations; Investigating Currents.

If you have enough time to do both as written, then begin with Session 1.6 in a computer lab or other location where participants can work in groups doing the balloon simulation

investigation. Mostly follow the Teachers Guide instructions. Briefly review results from last week's Session 1.5 and then facilitate students in designing and conducting simulation investigations. Choose how you want the different groups to share with each other, and then debrief as a whole class.

If you don't think there is enough time to do both 1.6 and 1.7, then you can shorten 1.6 by doing it as a whole class experience. Begin by projecting the simulation and having the tank contain room-temperature water. Participants can still work in groups to make their group prediction about what will happen with each of the different balloons. Volunteers can then move the balloons one at a time into the tank to show the results. Repeat with the other tank liquids. If participants are not familiar with molasses, you can compare it with honey. For either way of doing Session 1.6, you can complete the set-up for 1.7 while the whole class is doing 1.6

Session 1.7 is designed to have 9 separate ocean stations where participants would observe what happens when colored water of a specific temperature and salinity is allowed to enter a tank of room temperature water (7 of the stations have freshwater in the tank and the last 2 have saltwater in the tank). Start by introducing the activity, and having participants work in small groups to predict what will happen at the stations.

Follow the instructions for making predictions as you model Station #1 and ask them to predict as a whole class what will happen there. Since this is a lab day, after discussing Station #1 you should have time for participants to individually write predictions for all the other 8 lab stations. If there is not enough time, then you can follow the directions in the Teachers Guide for predicting and visiting fewer stations.

Participants should have their student sheet ready with their written predictions (Student Sheet "Investigating Currents" in their Investigation Notebook). Assign one or more participants to get specific stations started (setting it up and then removing the pushpin). Every participant should observe each station and make a note of what is happening at that station, writing about and drawing the results in the columns on the student sheet.

Day 3: Session 1.8: Making Sense of Ocean Currents
Generally follow the instructions in the Teachers Guide about structuring the conversations to bring out the main concepts. Denser water sinks. Cold water is denser than warm water. Salty water is denser than fresh water. Differences in density can lead to convection currents.

Use the Model Oceans Animations to reinforce the results and conclusions. You could skip these animations as they repeat what was done at the stations. Alternatively, you can compare with the results that the class got. This simulation/animation is on the Ocean Science Sequence Disc in a Mac and a PC version.

There are two additional media resources you can share with the participants. They are accessed from the Lawrence Hall of Science website for the OSS 6-8 curriculum at:

http://mare.lawrencehallofscience.org/curriculum/ocean-science-sequence/oss68-overview/oss68-resources

Video: Convection Current Demonstration
Animation: Great Ocean Conveyor Belt

The end of Day 3 would be a great time to have a general discussion about what they did and learned in Sessions 1.5, 1.6, 1.7 and 1.8 and, equally important, how they could teach those concepts with their students.

HOMEWORK ASSIGNMENT
Two Guiding Reflections (same questions used at the end of every week):

1) Choose a concept of activity from this week. How would you teach this concept or activity with your students?
2) What would be hard for your students to understand about this concept or activity?