SMILE High School Clubs - Activity 1

Marine Debris around the World

Time needed:
Two 45 minutes sessions

Materials needed:
Session 1

- 9' x 13" (or larger) tray for water
- Water to fill the tray three-quarter ways
- 10 red sequins
- 10 blue sequins
- 2 drinking straws
- 1 student work sheet
- 1 drawing pencil

Session 2

- Marine debris from around the world (provided in packet)
- Marine debris clue cards
- Maps
- Student worksheet

More challenges:

- Discuss how temperature would impact ocean circu-lation. Put a food-dyed ice cube in the tray and see what it does.

Background

Ocean water circulates around the globe on the surface and at great depths. The reasons for this movement differ for surface water and deep ocean water. At the surface, the main reason for ocean water circulation points to the prevailing global winds thus creating wind-driven ocean circulation. At depths, the main reason for ocean water circulation points to temperature and salinity differences thus creating density-driven ocean circulation. In this lesson (sessions 1 and 2), you will explore surface currents within ocean gyres (ocean circulation patterns), and model what would happen should one of these ocean gyres slow down. In addition, you will be exploring how currents and gyres move trash around the ocean.

Session 1

1. Divide students in 2-4 groups. Distribute materials around the room. Each group should have one tray, 10 red sequins, 10 blue sequins, and two straws.
2. Explain to the students what gyres are. You can use the National Geographic website for brief information and images: http://education.nationalgeographic.com/education/encyclopedia/ocean-gyre/?ar_a=1
3. Have the students place the 20 sequins (10 blue and 10 red) in the water so that they float.
4. Have the students hypothesize how the air must move in order for the sequins to move in circular motion. On the drawing sheet, have the students draw arrows representing air flow direction and small circles to represent the sequins in movement, illustrating their expected outcome.
5. Have the students test their hypotheses by using the straws to gently blow air on the surface of the water to create movement of the sequins. Was their hypotheses correct or not?
6. Discuss with the students what changes would they make to enhance the circular motion of the sequins on the surface of the water? Have the students test their new hypotheses.
7. Finalize discussion with how does their model compares to surface circulation around the globe? What other factors help move surface water? Besides winds, what else may help to move surface currents in each of the ocean basins? What would cause one current to move at a faster rate than other currents within a gyre?

Videos you can watch with the students:
World Ocean Circulation: http://www.youtube.com/watch?v=h6i16CrI8ss
Ocean Gyres: http://www.youtube.com/watch?v=h6i16CrI8ss

Session 2

1. Decide which maps you would like the students to use. The maps should have enough details to help students determine waterways that lead into larger bodies of water. If you do not have a paper map, consider using online map systems. Google Earth allows for satellite imaging, as well as, other ways of looking at this type of information. Project this image at the front of the class.
2. Explain to the class that you went to the beach one weekend and gathered the following marine debris. It is their job to find out where the trash came from and how it got to the Oregon coast.
3. Have each group figure out where each piece of marine debris comes from and find the location on the map. Make sure they look at the wrapper and find the true country of origin. They can use the clue card to identify the language and country.
4. At each country, have the students trace the rivers that lead to bays or to the oceans. Using what they learned from the previous lesson, what currents would move the trash from the country of origin to the Oregon coastline?

Questions to consider asking students throughout process:

- How do you think wind acts on water?
- What other forces would create ocean circulation?
- How could a large ocean garbage patch be created? (http://marinedebris.noaa.gov/)

Challenge Task:
Scientists have been using computer models to help them study ocean current circulation. OSCURS, Ocean Surface CURrent Simulator, is one model. Using the C-MORE curriculum (http://cmore.soest.hawaii.edu/education/teachers/science_kits/materials/Marine_Debris/Marine_Debris_Lesson_Plans.pdf) use OSCURS to predict the landing of ocean debris.

Other Resources:
This activity was adapted from the following sources. There are more activities available on these sites:

- Windows 2 the Universe
  http://www.windows2universe.org/teacher_resources/leaky_gyre.html
- National Geographic Education -
  http://education.nationalgeographic.com/education/?ar_a=1
- Science News for Kids –
  http://www.sciencenewsforkids.org/2011/06/swirling-seas-of-plastic-trash/
- C-MORE -
  http://cmore.soest.hawaii.edu/education/teachers/science_kits/materials/Marine_Debris/Marine_Debris_Lesson_Plans.pdf

Name_____ Student Worksheet

Session 1 – Gyres

1. **Draw your prediction below of which direction the sequins will move when you blow across the water. You can use arrows to show air flow direction and small circles to represent the sequins in movement.**

2. **Test your hypothesis. Did your model do what you expected it to do? Why or why not? Explain below.**

3. **What changes will you make changes to your model to improve the movement of the sequins? Draw your new hypothesis below with arrows to show air flow direction and small circles to represent the sequins in movement.**

4. **Test your hypothesis. Did your model do what you expected it to do? Why or why not? Explain below.**

Session 2 – Where's it from?

1. **Where is your piece of trash from? How do you know?**

2. **Which rivers and waterways could have been used to reach the larger oceans? Make sure to be specific and identify main waterways in the country of origin.**

3. **Which currents could have driven this piece of trash to Oregon Coast? Why?**

4. **Which currents can carry pieces of trash back to this country?**