The Great Plankton Race

A Hands-On Activity for Children Ages 4-14

Objective: Students use a variety of materials to construct various models of plankton to gain an understanding of neutral buoyancy.

Time: One 50-minute class period

Background:

Plankton are a very important part of the food chain in the northeastern Gulf of Mexico. The word **plankton** comes from the Greek word "**planktos,**" which means "wandering." Plankton drift in the ocean at the mercy of the **currents**. Their lack of mobility separates plankton from the **nekton**, which are organisms (such as fishes) that can propel themselves through the water.

Some planktonic organisms can be quite large (like jellyfish); however, most are smaller than nekton—small enough that they have to be viewed under a microscope. Plankton that photosynthesize are called **phytoplankton** and are made up of organisms called algae. Plankton that eat other plankton are called **zooplankton**, and are made up of tiny animals and single-celled protozoans.

Organisms that spend their whole lives drifting are called **holoplankton**; those spending only part of their lives as plankton are called **meroplankton**. Most **meroplankton** are the larvae of animals that spend their adult lives either on the bottom or free swimming.

To avoid sinking, plankton must maintain **neutral buoyancy.** An object that has neutral buoyancy will neither sink nor rise. Although plankton can't control their movements against the current, they are able to control their buoyancy by increasing their surface area-to-volume ratio as well as by producing and releasing lipids (fats).

Materials:

- Aquariums (one for every 10 students) or buckets (one for every 5 students) filled with water
- Stopwatch or watch with second hand
- Various construction materials *(below are suggestions, but any combination of materials with a variety of densities will work.)*:
    - toothpicks
    - feathers
    - sponges
    - beads
    - straws
    - metal washers

Procedure:

1. Discuss with students what plankton look like and what adaptations help them stay near the surface of the ocean. (See supplemental materials for more information and images.)
2. Divide students into groups of five or fewer and explain that they will be sharing materials but each student will create an individual model.
3. Instruct students to use the materials provided to design models of plankton that will remain neutrally buoyant in their water environment. Note: The objective is to make a model that neither remains floating on the surface nor sinks quickly to the bottom.
4. Place the aquariums or buckets in a separate, water resistant area, away from the students' work area. Give students time to experiment with their models and make modifications as needed.
5. Ask students to record each modification and give their rationale on the provided data worksheet (See Extension for further discovery.)
6. One team member is in charge of timing how long the zooplanktonic organism is in the water column. Instruct students to begin timing when the organism is completely submerged and stop when any part of the organism touches the bottom of the tank. After all of the teams have completed their trials, they should record their data on

their worksheets and on the class chart on the main board. This procedure is repeated several times (3 to 5), giving students the opportunity to learn from and improve upon their previous designs.

Discussion Questions:

1. What did you do if your plankton floated on the surface? How about if it sank to the bottom?
2. What are the advantages to plankton of achieving neutral buoyancy?
3. How did you feel when your plankton model didn't achieve neutral buoyancy? What changes did you make to ensure success? (Sometimes a scientist will work on the same problem for years!)
4. What methodology worked best? What materials worked best?

Evaluation:

If there is time at the end of the activity, have students draw a picture of their plankton model and label their model's features. Ask them what additional modifications they would make if there were more time/materials.

Extension:

During Step 4, ask students to record the time it takes for each of their model planktons to sink using the corresponding data table (See supplemental materials). The rate of sinking is calculated by dividing the distance from the surface to the bottom of the test environment by the elapsed time. A simple bar graph of the results from each student or team of students can be made and discussed.

Watch demonstration video: http://www.cpalms.org/CPALMS/perspectives_teacher_SC8P83_AV_1.aspx