Shark Power! Demonstration Pre-Visit Activity Sheet

This sheet contains some information to prepare you for the demonstration's contents and some science concepts. Please be aware that these activities might not be appropriate for all grades and groups. Feel free to modify as required to meet the needs of your students.

Shark Biology: Sense of Hearing

Concepts:
1. Sound travels through water four to five times faster than it travels through air.
2. Sound is created by vibration. Different objects will vibrate at different frequencies. The faster an object vibrates the higher the pitch, the slower it vibrates the lower or deeper the pitch.
3. A struggling fish produces a low frequency sound in the water. Sharks are particularly well suited to hearing low frequency noises.
4. Hearing is the most sensitive of the shark's senses. Some sharks can hear a fish struggling in the water at a distance of 400 meters (about 1/4 mile).

Materials:
1. Two empty bathroom tissue tubes
2. Two empty paper towel tubes
3. Tape

Directions:
1. Tape together one bathroom tissue tube and one paper towel tube to make one long tube. You should now have three tubes of different lengths.
2. Hold the shortest tube against your ear and listen to the background sound in the room.
3. Hold the medium length tube against your ear.
4. Compare the room's background noise through this tube to the first tube.
5. Predict the effect that you'll notice with the third and longest tube.

Human Interactions: Fishing

Concepts:
1. Sharks attack and kill between 12 and 25 people per year.
2. People kill approximately 100 million sharks (~600,000 tons) per year.
3. People kill sharks - for meat; fin soup; cartilage for medicine; oil for tanning leather or for lamps; hide for leather goods; fish meal; and for sport.

4. Some species of shark have been severely overfished. Because most sharks have few numbers of young (pups) per litter and a long gestation period, overfishing can quickly cause a decline in a species population.
5. The Sandbar Shark, Dusky Shark and Basking Shark, all indigenous to the Virginia coastal waters, have been the victims of overfishing.

Materials:
1. Paper
2. Pencils
3. Calculators

Directions:
1. Calculate the ratio of shark kills by humans to human kills by sharks.
2. Calculate the number of sharks killed each year per living person (Use a world population of 6 billion).
3. Calculate the ratio of kills by weight (assume 200 pounds per man or use the average weight of the students in the class).

Explanation:
1. Using the conservative estimate of 25 persons killed per year you should calculate a kill ratio of 4 million sharks to one human (100 million ¸ 25).
2. The number of sharks per person equates to one shark for every 60 people on earth, each year.
3. The calculation by weight should be approximately 240,000 pounds of shark killed per pound of man killed, or 48 million pounds of shark killed per man.

Shark Physics: Buoyancy

Concepts:
1. One of the many differences between sharks and bony fishes is the way in which they maintain their position in the water. Most bony fishes have gas-filled swim bladders to keep them from sinking. This allows them to achieve either a neutral buoyancy or a slightly positive buoyancy (they tend to float). Conversely, most sharks do not have swim bladders and have a slightly negative buoyancy. They use their oil-filled liver for buoyancy.
2. Because of this negative buoyancy, most sharks must swim continuously to keep from sinking. Swimming alone will not keep a 100-pound shark from sinking like a stone.
3. Up to 40% of a shark's weight is concentrated in its liver. The shark's liver contains a large amount of oil. Oil is lighter than water, which results in a significant reduction in the shark's

waterborne weight.

Materials:
1. 4 medium sized balloons

2. Aquarium or large pail filled with water
3. Vegetable oil
4. Table salt
5. 1 2-liter bottle
6. 4 clean 1000 ml beakers or large jars
7. Balance scale

Directions:
1. Put one liter of water in a two-liter bottle. Add 33 grams (3 level tablespoons) of table salt and mix to dissolve.
2. Fill one balloon with air, the second with an equal amount of oil, the third with an equal amount of fresh water, and the fourth with an equal amount of salt water. Try to avoid air bubbles in the oil and water balloons. The oil and salt water balloons can be filled directly from their respective bottles by fitting the balloon to the bottle and inverting.
3. Place the balloons into the aquarium and observe how each one floats or sinks.
4. Weigh each beaker / jar to determine its mass.
5. Pour the contents of each balloon into a beaker. Determine the mass of the filled beaker and record the volume of each fluid.
6. Subtract the mass of each empty beaker from the mass of each filled beaker to determine the mass of each fluid.
7. Divide the mass of each fluid by its volume to determine the mass per unit volume for each fluid.
8. Calculate the volume (liter) of oil required for a 100 pound (45.4Kg) shark to achieve neutral buoyancy. The following equation can be used:

$$\frac{\text{Mass (Kg) of Shark}}{\text{Volume (liter) of Salt Water}} = \frac{\text{Mass (Kg) of oil}}{\text{Volume (liter) of oil}}$$

Explanation:
1. Air is the lightest of the four, followed in order by oil, fresh water and salt water. You should notice a difference in how much each balloon floats (or sinks). This is an indication of each one's buoyancy.
2. The oil balloon will float up out of the water to some extent.
3. The fresh water balloon will float just slightly due to the rubber of the balloon.
4. The salt-water balloon should sink.