What's happening to the Corals: Coral Reef Skeletons and Climate Change

Objective

This lesson helps students understand what climate change is and how it is impacting coral reef ecosystems around the world. Students will experiment with sodium bicarbonate and calcium carbonate to simulate how algae in coral polyps react with seawater to assist the coral polyps in forming skeleton as reef rock.

Time needed

Prep time: 30 minutes

Class time: 30 minutes for preparation with students, overnight incubation time and 1 hour for finishing steps

Background Information

For protection and support, hard corals build skeletons made of calcium carbonate. To do this, a coral polyp secretes layer upon layer of calcium carbonate underneath its body. As time goes by, the skeleton grows larger and larger, and the polyp lives on its outside edge. As long as a polyp can get the right building material from the water, it can build a strong skeleton.

Hard corals are often called the reef builders because their skeletons provide support for other corals and other organisms. Soft corals do not build calcium carbonate skeletons. Instead they have spines that support them. They are not considered reef-builders.

When hundreds or thousands of coral polyps build their skeletons close together, they create a calcium carbonate structure that provides habitat and food for a variety of organisms. This is known as a coral reef.

Taken from this website. GREAT resource for teachers to understand a bit more about what makes up a coral and how it grows.

http://www.teachoceanscience.net/teaching_resources/education_modules/coral_reefs_and_climate_change/what_is_a_coral/

Engage
Students are drawn into the activity by conducting the experiment themselves and building a coral skeleton themselves. They will use materials that are also found in the ocean (calcium carbonate and sodium bicarbonate), to recreate a coral skeleton. This allows students to understand how a

coral works to continue building its hard substrate so it can continue to grow and survive in an ecosystem. They will begin to understand what makes up a large coral reef and the importance of these hard structures.

Explore – What is a Coral Skeleton Demonstration

Experiment Questions:

1. What does a coral skeleton look like and what is it made out of?

Procedure:

1. **For instructor use only!** In small groups, take the real coral skeleton provided and squirt some HCl acid on the coral skeleton. Be careful as this is an acid! No students should use this solution!

2. The coral skeleton will start to fizz at the area the acid was added.

3. Explain to the students that this coral skeleton is made up of calcium carbonate and the addition of an acid to it will start to dissolve the coral skeleton, hence why there is a fizzing sensation occurring.

4. If time permits, students can experiment in groups themselves by adding some vinegar to some samples skeleton. Students can use the vinegar.

Explore – How Corals Build their Skeleton Activity

Experiment Questions:

2. How does a coral organism build its skeleton?
3. Where does hard coral reef material come from?
4. Why is it important for corals to have a hard skeleton?

Procedure:

1. Pose the question, "Where does hard coral reef material come from". Write down possible answers from students on the board.
2. Have students break a piece of chalk (calcium carbonate) inside a paper bag with a hammer.
3. Dissolve the chalk in 250 ml of vinegar (a weak acetic acid). Label the container. Let the mixture stand overnight.
4. The next day, have the students observe their glass of vinegar and chalk and write down what they see.
5. Label 2 of the clear cups as follows: 1 16-oz. cup, "dissolved limestone," and the 8 oz. cup, "dissolved baking soda."

6. Pour off the clear liquid from the chalk mixture into the "dissolved limestone" (calcium carbonate) cup.
7. Place 8 oz. of water in the second 16 oz. cup. Add 6 teaspoons of baking soda (sodium bicarbonate) to the water. Stir and let stand about 15 minutes.
8. Pour off the clear liquid in the baking soda cup into the 8 oz. cup labeled "dissolved baking soda."
9. Pour the baking soda solution from the 8 oz. cup into the "limestone" cup. Have students carefully observe what happens.

Explain that this is similar to what happens when seawater comes in contact with the algae in the coral polyps. The polyps secrete the calcium carbonate downward as skeleton. Skeleton is laid down in specific crystal structures by each type of coral.

Explain

Understanding the biology of a coral and the form and function of the coral will help students understand how a skeleton is excreted and why corals do this to survive. Reviewing what a coral is (animal that has a special partner called a symbiont) will help students understand the process.

The experimental results demonstrate the process of building a coral reef, secreting a bicarbonate skeleton that allows corals to thrive in coastal areas and allows other organisms like fish and other invertebrates live and protect themselves from predators.

Elaborate

Students will understand how a skeleton is builtd and then begin to translate this important process to climate change and discuss how climate change is impacting the ability for corals to secrete skeleton.

As the ocean becomes warmer and more acidic, the ability for corals to collect the proper "ingredients" of calcium carbonate and sodium bicarbonate becomes harder. This inability to create a skeleton prevents the growth of corals. Students can also think about the relationship between coral growth and sea level rise. If there are unable to grow taller and larger and the ocean continues to rise, then corals wont be able to survive and will eventually die.

Resources

Additional Resources

http://www.teachoceanscience.net/teaching_resources/education_modules/coral_reefs_and_climate_change/what_is_a_coral/

http://www.coexploration.org/bbsr/coral/html/body_basic_coral_biology.html
http://www.coralscience.org/main/articles/biochemistry-2/how-reefs-grow

Resources Used:
http://hilo.hawaii.edu/affiliates/prism/documents/growingacoralskeleton3.3.pdf