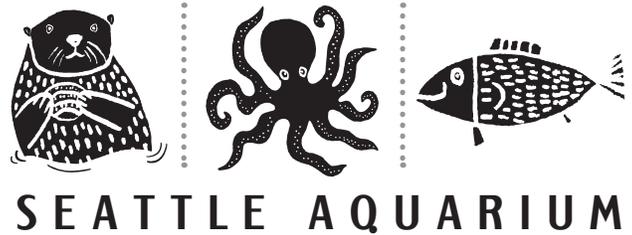# Build a Shell game

SEATTLE AQUARIUM

Ideal group size:
Groups of four students

Suggested grades:
4th grade & up

Time:
30 minutes

Materials needed:
 - LEGO® or DUPLO® bricks
 - Silly Putty®
 - Dice (two)
 - Shells (optional)
 - Copies of the scenario chart

Space:
Desk clusters

Goal:

This activity explores why shelled animals need their shells and what might make it harder for those shells to grow. The ocean acts like a sponge, absorbing CO2 from the atmosphere. This extra CO2 makes the water more acidic, which makes it harder for animals to build and maintain their shells.

Setup:

Set up multiple stations with the appropriate materials (groups of four students at each station). Have a few LEGO "shells" already started as examples. A "shell" is made from a LEGO baseplate with a structure built on it; the structure should have enough space inside for a Silly Putty "animal."

Instructions:

1. Take time to review the following questions with your students:

    • Why does a soft-bodied animal need a shell?

    • What would happen if its shell was not there?

    • How does CO2 get into our ocean and what effects might this have on animals that live there?

2. Review the rules of the game with the students. The students will be in teams of two, competing against each other at their stations. Teams should take turns rolling the dice to see what happens next. Students should read the outcome of the roll to the group. They should then add or remove the required number of shell pieces (LEGOs). Make sure they understand that each roll of the dice will lead to a different result and that they will need to consult the chart of "scenarios."

3. Review the scenarios with the students to make sure they understand what they all mean and why they would be beneficial or harmful to a marine animal with a shell.

4. Instruct the students to play this game until each team has taken 10 turns. At that point, come back together as a class to discuss what happened to their shelled animals and why.

5. Continue playing the game for another round of 10 turns or make this a tournament and have winning teams compete against each other.

Build a Shell game

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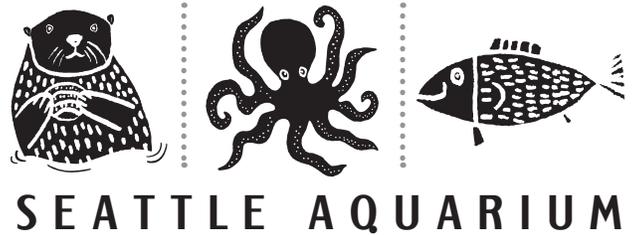
Dice roll scenarios:

1. N/A.

2. Find food: add one shell piece.

3. Plankton bloom! Find lots of food: add two shell pieces.

4. Renewable energy from solar panels replaces coal power plants: add three shell pieces.

5. Shell damaged by a predator: remove one shell piece.

6. Too many cars on the road adds CO2 to the atmosphere: remove two shell pieces.

7. Upwelling brings more acidic water from the deep ocean: remove three shell pieces.

8. Coal power plants add CO2 to the atmosphere: remove two shell pieces.

9. Shell cracked by a hungry gull: remove one shell piece.

10. Alternate energy replaces fossil fuels, causing less pollution: add three shell pieces.

11. Use less energy at home by turning off computers and video games when you are done: add two shell pieces.

12. A beach cleanup group removes spilled oil from the beach: add one shell piece.

Background information:

Easier explanation for younger students

The ocean is always changing. Sometimes these changes can help animals survive—for example, there might be more food in the water. Sometimes these changes can hurt animals—for example, the water gets too warm or has too much CO2, which makes it harder for some animals to survive. We need to help take care of the ocean by using less energy (turn off lights when not using them, take the bus or ride your bike instead of asking your parents to drive you).

Ocean/animal connection

Adding carbon dioxide (CO2) to water creates carbonic acid, decreasing the pH of the ocean (making it more acidic). Right now, the ocean has an average pH of slightly above 8, which is close to neutral but slightly basic (pH 7 is neutral). When there is a lot of CO2, the corresponding decrease in pH can impact the ability of animals to survive.

Shelled animals (such as hermit crabs, mussels, oysters, some types of plankton, etc.) rely on their shells for protection. When there is more CO2 dissolved in the ocean, these animals may not be able to make shells or their existing shells may start to dissolve. Without shells, these animals cannot live.

Animals that do not make shells are also affected by ocean acidification. When shelled animals, especially those lower on the food web (many types of plankton, for example), cannot survive, there is less food available for other types of animals. Without enough of the right type of food, animals cannot survive. So if small animals like oysters disappear, animals that feed on oysters may also not be able to survive.

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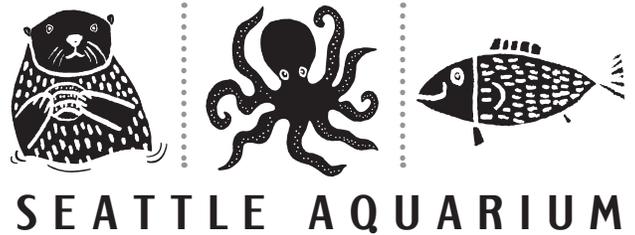
What is ocean acidification?

As human activities put more and more CO_2 into our atmosphere, the ocean acts like a giant sponge, absorbing some of that extra CO_2. Without it, our planet would be warming even faster than it already is. However, more CO_2 in the ocean causes a different type of problem that is just as dangerous as rising temperatures. As the CO_2 dissolves in the water, it creates carbonic acid, which interferes with the ability of many animals to grow their shells.

What can we do?

Ocean acidification is already happening. It is up to us to make changes that can help to reduce the amount of CO_2 in our atmosphere (and therefore in our ocean). We can make changes on a personal level and we also need to make changes on a global level.

So, where does CO_2 come from? The largest source of CO_2 in our atmosphere is from the use of fossil fuels such as oil, coal and natural gas. Any energy we use that comes from fossil fuels puts more CO_2 in the air.

On a personal level, we can pledge to use less energy at home, at work, at school, and when we travel. Walking, riding a bike, taking the bus or carpooling all produce less CO_2 per person than driving a car on your own. Eating seasonal, local foods that don't have to travel long distances to get to our dinner tables can also help to reduce CO_2 emissions.

Saving energy at home by turning down the thermostat, reducing use of air conditioning, turning lights off when not in use, and unplugging energy "vampires" can also help to reduce CO_2 emissions.

Energy produced from sources other than fossil fuels may have lower CO_2 emissions. Consider investing in renewable options like solar and wind power. Your energy company may even offer these options already—just ask them.

Personal actions are a great start, and if everyone takes part they can be part of the larger solution. However, it will take global action to make major reductions in our CO_2 emissions. Support political candidates who share your values and concerns about climate change and ocean acidification. Write to your representatives to tell them these issues are important to you and to find out what their stance is.