Ocean Acidification Awareness

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Subject/Grade: Science/8th

Lesson Summary *(1-2 Sentences)*
How are you going to share Ocean Acidification with your students? How will this fit into your regular scope and sequence?

Students will explore various hands-on activities aimed at understanding the process of ocean acidification. Then, they will research an environmental impact related to ocean acidification. Next, they will work in teams to create a social media campaign which will raise awareness of ocean acidification and its impacts. Finally, the projects will be posted across the school's various social media accounts. The lesson will fit into the existing scope and sequence during a PBL (project based learning) assignment which is centered around *Human Impact on the Environment,* specifically *MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.*

NOAA's Mission: Awareness of careers related to NOAA's mission (understanding and predicting changes in climate, weather, the ocean and coasts)

NOAA's Mission: science, service and stewardship
1. To understand and predict changes in climate, weather, ocean and coasts;
2. To share that knowledge and information with others; and
3. To conserve and manage coastal and marine ecosystems and resources.

One aim of this project is to help students understand the need for interdisciplinary collaboration. Students will be able to see how science and social media marketing intersect in order to raise awareness regarding environmental issues.

Ocean Literacy Education Framework Standards To which standard(s) does your lesson connect most closely?

6. The ocean and humans are inextricably interconnected.
E Changes in ocean temperature and pH due to human activities can affect the survival of some organisms and impact biological diversity (coral bleaching due to increased temperature and inhibition of shell formation due to ocean acidification).

Learning Goals: Make sure to address how your lesson will:

- Involve your students in a Community Environmental Action
- Use the Science and Engineering Practices

During the first phase of the lesson students will *develop and use a model* in order to learn about ocean acidification. After students have explored ocean acidification using models they will *obtain and evaluate* information regarding its environmental impacts. Finally, they will *communicate the information* in a social media post that will raise awareness of ocean acidification among their community. There is also the possibility of an extension activity wherein students *analyze and interpret data* related to the metrics of their social media posts in order to reflect on the projected impact.

Materials/Resources: Of the hands-on activities explored, which will you use in your classroom?

Students will explore ocean acidification using two hands-on activities. The first activity will require students to use a straw to blow into a cup with a solution of Bromothymol blue until a color change occurs, thus demonstrating how an increase of carbon dioxide increases the acidity of a solution. Next, students will complete an "Ocean Acidification in a Cup" activity. "This activity illustrates how the diffusion of a gas into a liquid can cause ocean acidification. It also models part of the short-term carbon cycle—specifically the interaction between our atmosphere and the ocean's surface."

"Ocean Acidification in a Cup." Exploratorium, 18 Apr. 2023, www.exploratorium.edu/snacks/ocean-acidification-in-cup.

The lesson will be delivered to the entire 8th grade class at my school, which is approximately 125 students. In addition, our school hosts a STEAM Carnival at the end of each year and a large number from the community attends. The "Ocean Acidification in a Cup" will be a great hands-on activity for the event. A select group of students will be able to lead the activity with community members and explain what they know about ocean acidification and its impact on the environment. Materials are needed for all students.

Instructional Outline: This should be the bulk of your writing. Bullets of what the students will do throughout the lesson to reach the learning goals you have set.
You may link to the hands-on activity you will use, but also explain any modifications you might need to make to it, as well as pre- or post- activities you will do with your students around it.

Explore Activity adopted from STEMscopes curriculum

1. Lead a class discussion regarding the impacts humans have on the environment. Ask students "How do humans impact the land AND the oceans?"
2. Introduce the question:

(CCC-2) Does an increase in carbon dioxide have a negative effect on marine animals?

3. Instruct students to complete their hypothesis.
4. Instruct students to follow the instructions for Acidic Oceans.

Acidic Oceans

1. Have students measure 50 mL of Bromothymol blue solution (concentration .04%) using the graduated cylinder, and transfer to the beaker.
2. Tell students that bromothymol blue is an indicator used to determine if a solution is acidic or not.
3. Have students record the color in their chart.
4. Have students exhale the carbon dioxide into the solution using the straw until you get a color change.

Discuss:

1. What do you think your carbon dioxide represents?
2. What do you think the solution represents?

Discuss the results of the experiment and then the questions below:

1. Compare your results to the pH scale below. Is your solution increasing in acidity or decreasing?
2. What do you think caused the increase in acidity?

"Ocean Acidification in a Cup" sourced from The Exploratorium
https://www.exploratorium.edu/snacks/ocean-acidification-in-cup

Edpuzzle on Ocean Acidification
https://edpuzzle.com/media/6180534653e78941ac4f417e

Assessment: How will you check your students' understanding? Check out these creative assessments if helpful.

Students will create a social media campaign demonstrating their understanding of ocean acidification and its environmental impacts.

Ocean Acidification: Social Media Campaign
Ocean Acidification: Social Media Campaign Student Handout