



Teaching Ocean Acidification

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Abstract

Ocean acidification is a phenomenon that results from increasing anthropogenic carbon dioxide emissions on land. As carbon dioxide is absorbed, a series of chemical reactions causes an increase in acidity. This leads to many detrimental effects on marine organisms reverberate up the food chain.

One reason ocean acidification remains a grand challenge is because of how difficult it is to communicate to a general population. When people hear ocean acidification, they recognize the concept but don't fully understand its effects or the potential it has to impact us down the line. Which is why our approach is to try and make ocean acidification as understandable as possible.

Our contributions to society has been a small one so far. We prepared a lesson for a local APES class regarding ocean acidification hoping to influence young minds to become interested in this challenge. Our group also made an infographic to communicate ocean acidification in a simple way while conveying there is a potential solution (Figure 1).

Introduction

- The ocean is a carbon sink, so as atmospheric carbon levels increase, dissolved carbon levels increase¹
- Increasing carbon dioxide in the water results in an increase in acidity and a decrease in carbonate ions²
- Many marine creatures, particularly shelled organisms are experiencing effects such as weakened shells, vulnerability to disease, and changes in behavior³
- These effects reverberate up the food chain and have real impacts on humans.
- Lack of regulation on climate issues and lack of awareness about ocean acidification contribute to these effects increasing in severity and urgency.
- Our group decided that the best approach to tackle this knowledge gap was to raise awareness about ocean acidification

Methods

- Developed an infographic to explain acidification and its effects in a concise and clear way, as well as explaining a potential solution of kelp farming (Figure 1)
- Created a lesson plan discussing background of ocean acidification, its effects, opportunities to get involved, and potential careers
- Developed interactive demonstrations for the students (Figure 4)
- Taught our lesson to three advance placement environmental science classes over Zoom
- Created questions for students to gauge knowledge (Figure 2)

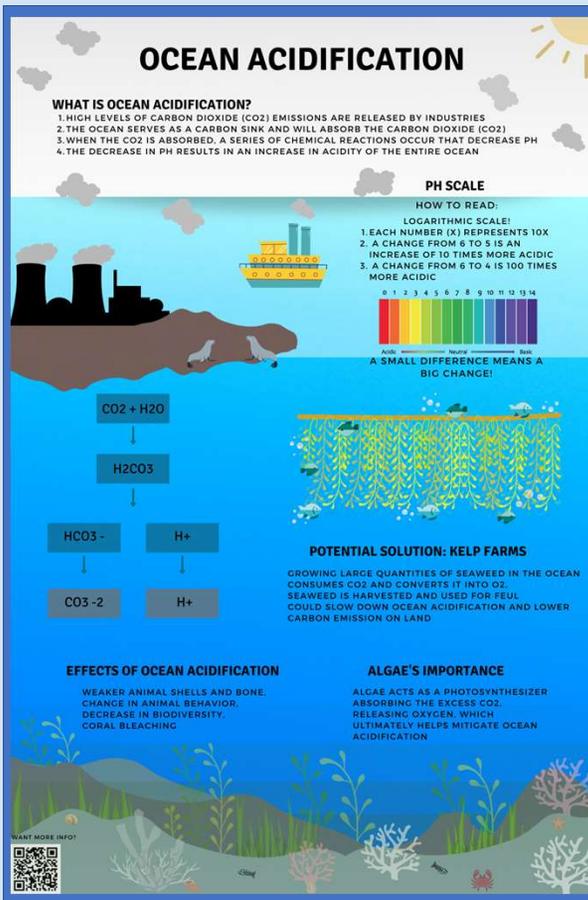


Figure 1: Ocean Acidification Infographic.

1. The average concentration of carbon dioxide (CO₂) in the atmosphere has...
2. When carbon dioxide dissolves in water, it forms a(n) _____.
3. When carbon dioxide dissolves in water, the pH _____.
4. A slight change in the ocean's pH is...
5. What is coral bleaching?
6. Which of the following greenhouse gases is the most responsible for Ocean Acidification?
7. Which of the following compounds do most shelled creatures in the ocean depend on, and are beginning to lack?
8. The pH scale ranges from 0 to 14 and is a measure of how acidic or basic a substance is. Pure water is _____ with a pH of 7. Solutions with a pH less than 7 are _____ while solutions with a pH greater than 7 are _____.
9. If the pH of a solution changes from 2 to 3, there is a _____ change in acidity.
10. How could Ocean Acidification impact humans?

Figure 2: List of questions students were asked.

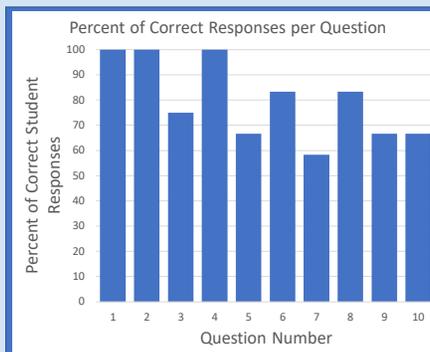


Figure 3: Graph of student responses to ten questions about ocean acidification before the lesson.



Figure 4: A demo of chicken bone in vinegar.

Results

As we constructed our lesson plan, we had to consider how best to keep the students engaged through asking them questions and doing demonstrations (Figure 4). By making the infographic we learned how to communicate information clearly and concisely within a small amount of space (Figure 1). Through our interactions with Mr. Kim, we learned teaching tips and techniques based on his experiences with online learning and applied these as we taught our lesson.

Conclusion

- Students became more confident over the course of the lesson
- Students were fairly knowledgeable at the start of the lesson, and by the end, were able to correctly respond to nearly all questions
- Demonstrations related to ocean acidification helped students understand concepts

We were able to successfully raise awareness, by teaching and assessing Mr. Kim's classes. In the future, we hope to distribute our infographic to the general population as well as more students, especially non-science students.

Acknowledgments

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