

Does discussing solutions to ocean acidification inspire students to want to take action?

Brian Erickson^a, Tracy Crews^b
^aOregon State University, ^bOregon Sea Grant

Action is needed to reduce ocean acidification

- Ocean acidification (OA) is the change in ocean chemistry due to increasing human created CO₂ in the atmosphere.
- OA already impacts the Pacific Northwest shellfish industry¹.
- OA is predicted to have mostly negative impacts on marine ecosystems & humans².

OA: the process

1. Human activities, like burning fossil fuels, release CO₂.
2. Oceans absorb ~25% of human created CO₂.
3. Ocean chemistry changes.

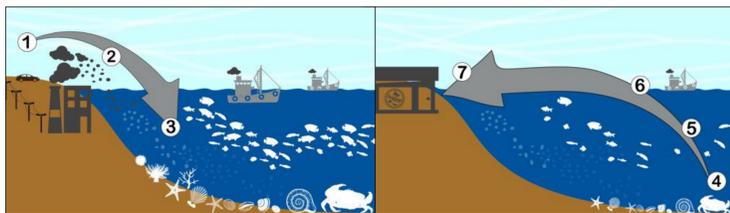


Figure 1 – The process of ocean acidification, in steps. Image by Samm Newton.

OA: a possible scenario

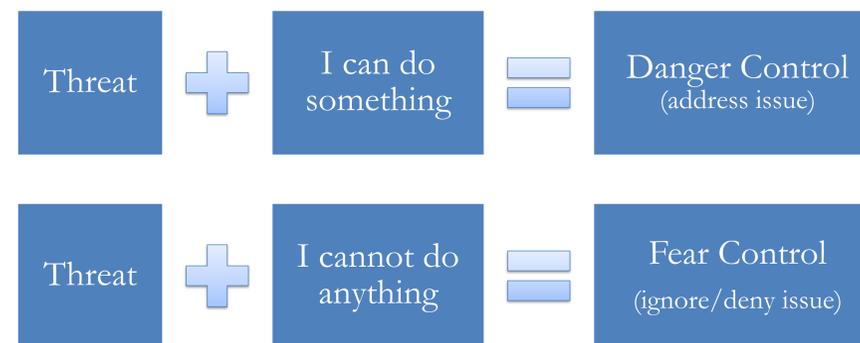
4. Carbonate, used for shell building, becomes more scarce. It takes more energy to make shells, leading to fewer & smaller shellfish.
5. There is less food for other organisms to eat. Fish abundance decreases & ecosystems are impacted.
6. There are fewer fish to catch, which could impact humans reliant on the ocean for food & jobs.
7. People who live away from the ocean could also be impacted (e.g., higher food prices).

“I know about [OA] but I don’t know what I can do.” –student pre-survey

Hypothesis:

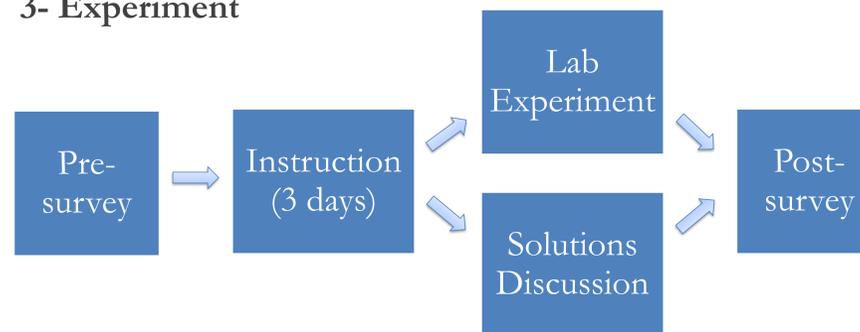
If we increase student knowledge of OA (threat) & ability to identify personal actions that can reduce OA (controllability), then students will show greater intention to address the issue.

Our theory of action^{3,4}



A project with three phases

- 1- Review existing OA teaching resources ($n = 71$).
- 2- Develop curriculum utilizing Understanding by Design⁵; pilot curriculum at Hatfield Marine Science Center’s summer camp; solicit educator feedback via focus group.
- 3- Experiment



Early results indicate areas for growth

- Many teaching resources are outdated, reinforce misunderstandings, & avoid discussing solutions.
- This could be the first study to measure student attitudes about OA before & after instruction.
- Pilot results indicate that, following classroom instruction, students showed increased knowledge of OA, perceived importance of working for solutions, and ability to identify actions to reduce OA.

Reducing OA requires addressing its primary cause: CO₂ emissions

11 actions could cut family energy use by up to 50%

- Adjusting your driving habits can cut total energy use 18%**
 - Carpool to school / work**: Carpooling saves gas; can cut total energy use 4.2%
 - Get frequent auto tune-ups**: Maintaining your car, including changing the air filter, can cut total energy use 5.9%
 - Avoid sudden acceleration & stops**: Reducing sudden stops and acceleration saves gas; can cut total energy use 5.2%
 - Combine errands to reduce trips**: Doing multiple errands in the same trip saves gas; can cut total energy use 2.7%
 - Reduce highway speed to 60 mph**: Driving 60 mph instead of 70 mph saves gas; can cut total energy use 2.4%
 - Maintain correct tire pressure**: Keeping your tires properly inflated saves gas; can cut total energy use 1.2%
- Making in-home adjustments can cut total energy use 9%**
 - Switch at least 85% of lights to CFLs**: Changing out incandescent lights for CFLs (or LEDs) can cut total energy use 4.0%
 - Adjust your thermostat**: Setting heat to 68°F day/65°F night and AC to 78°F can cut total energy use 3.4%
 - Wash & rinse clothes in cold water**: Washing clothes in warm or cold water, instead of hot, can cut total energy use 1.2%
- 2 higher-cost actions could cut total energy use nearly 23%**
 - Get a more efficient car**: Replacing your vehicle with one that gets 30+ mpg can cut total energy use 15.5%
 - Upgrade home insulation**: Caulking, weather-stripping, and insulating your home can cut total energy use 9.3%

Modified from Gardner, G.T. & Stern, P.C., 2008. The Short List: the most effective actions U.S. households can take to curb climate change. Environment, 50(5), 12-24.

Figure 2 – Handout used during lesson discussing possible solutions to OA.

Acknowledgements

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