



# COMPASS LESSON PLAN

## Grade 10 Biology: Ocean Acidification

By Rachel Delaney, Biology Teacher/Science Dept Chair at Colegio Americano de Guatemala

**Subject:** Natural Sciences

**Context:** Grade 10 Biology

**Topic:** Affects of Ocean Acidification on Urchin Shells

**Length of Lesson:** 2 weeks for unit, 2 days for summative

### SYSTEMS TOOL(S)

- Sustainability Compass
- Systems Iceberg
- Behavior Over Time Graphs
- Systems Mapping

### PURPOSE OF USING TOOL(S)

- Synthesizing Thinking
- Guiding Discussion

### MATERIALS & SETTING

Internet & the Google Suite

## LEARNING OBJECTIVES

Students understand the connection between human activity and trophic cascades as well as the effects of ocean acidification on crustaceans.

## LESSON STEPS



### Action Planning Template

Compass Education Level 1: Compass Practitioner

**Name:** \_

### Personal Action Plan

**Before working on this Action Plan please make a copy for your personal use.**

This Action Plan Template includes the submission documentation that can lead to Compass Education Level 1: Compass Practitioner certification.

Please note that several options are provided for you with regard to action planning. Feel free to use the one that best supports the work in your context.

Feel free to delete whichever information does not apply to your context.

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# LESSON STEPS



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### Unit Plan Development

Sample Template for Unit Plan and Lesson plan/s (or insert your own chosen template)

For in-class educators: Unit Plan Development	
Unit Title	Homeostasis: Urchins & Ocean Acidification (Complements <a href="#">The Virtual Urchin</a> )
Unit Duration	2 weeks
Subject/Course	High School Biology
Grade Level	10
School	American School of Guatemala
Designers	Rachael Delaney
Description	Through inquiry, students learn that carbon emissions cause ocean acidification which, in turn, affects the development of calcium carbonate shells in organisms such as urchins.

STAGE 1
Standards and Benchmarks/Learning Outcomes
Students understand the connection between human activity and trophic cascades as well as the effects of ocean acidification on crustaceans.
Enduring Understandings
Essential Questions

# LESSON STEPS

<b>Skills and Dispositions</b>
<p>Students can use systems thinking to connect events in marine ecosystems.            Students can show societal, environmental, economic and human health are all affected by carbon emissions.            Students can explain the series of events, patterns, systems and mentalities that contributed to the trophic cascade in the Pacific Northwest ecosystems (i.e. how whaling lead to orcas hunting otters which lead to an abundance of urchins which depleted the kelp population).</p>
<b>STAGE 2 - ASSESSMENT EVIDENCE</b>
<b>Formative</b>
<p>Students create a pacific northwest food chain.            Students create a pacific northwest energy pyramid.            Students explain how orcas entered some pacific northwestern ecosystems where they were not previously living.            Students explain the connection between carbon emissions and ocean acidification.</p>
<b>Summative</b>
<p>-Students create a loopy titled "Ocean Acidification and Urchin Shell Development". They will create 5 nodes, 4 of which will be            a) carbon emissions b) CO2 concentration in water c) ocean acidification d) shell development.</p>
<b>STAGE 3 – LEARNING PLAN</b>
<b>Revisit- ESSENTIAL QUESTIONS</b>
<p>What is a trophic cascade?            What is causing an accumulation of CO2 in the atmosphere?            What is causing an accumulation of CO2 in the ocean?            How does CO2 relate to acidification?            How do abiotic factors affect development of urchin shells?</p>

<b>LEARNING EXPERIENCES</b>
<p>Video: some animals are more equal than others.  <a href="#">Slides: Pacific Northwest Food Chain</a>            Interactive Slides: <a href="#">Some Animals Are More Equal Than Others</a>            Interactive Slides: <a href="#">Carrying Capacity</a>            Simulation: <a href="#">Virtual Urchin</a>            Loopy: (practice activity) Students will create basic Loopys from a list of topics created by me. I will first present a tutorial video</p>
<b>DIFFERENTIATED EXPERIENCES</b>
<p>Students will learning differences will complete the same activities but with direct support.</p>
<b>RESOURCES</b>
<p>Google Suite            Virtual Urchin Simulation (washington.edu)</p>
<b>STAGE 4- REFLECTION</b>
<p>Reflection: I should create a variety of topics for the summative to ensure skills are being transferred instead of students memorizing facts and making loose connections.</p>

## D.U.M.B. Goal Setting

For everyone: D.U.M.B. Goal Setting	
<b>Dream Driven</b>	<p>What's the dream?            Students understand that every single action and choice affects other living and nonliving parts of their local and</p>

## LESSON STEPS

	global community.
<b>Uplifting</b>	How is this goal lifting you and/or others? Me: I am uplifted by the idea of creating students who make informed decisions and understand the power they have to change the world. Others: Making the world a better place for all living things!
<b>Method-Friendly</b>	What practices can we create around this goal that will make it happen easier? Implementing the tools I learned in this course will be essential. This will not be a one-unit task, I will need to repeat the practices offered by these tools to create real "systems thinkers".
<b>Behavior Driven</b>	What behaviors will drive the change you want to see? Watching students make connections on their own, in previously unseen phenomena will show me that students are really starting to think about the interconnectedness of everything.
<b>Notes/Comments</b>	How will you use the systems thinking tools to support the achievement of the goal? Students will use the compass to reflect on topics like ocean acidification and trophic cascades. They will use the iceberg model to describe the events that lead up to the events (phenomena) that we investigate in class. Using loopy or creating similar diagrams will allow them to show their understanding of this connectedness. Inquiry is essential. My students very much have the opinions of their parents and the only way to "convince" them otherwise is for them to figure it out on their own. I don't want to tell kids what to think, I want them to make connections and have informed opinions.

THANK YOU FOR TAKING  
COMPASS EDUCATION LEVEL 1

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Level 1: Compass Practitioner | Compass Education | Page 5

## REFLECTION

### Plusses:

I should create a variety of topics for the summative to ensure skills are being transferred instead of students memorizing facts and making loose connections.

### Challenges:

For some students, the loopy website is confusing and doing this on paper might be wasier.

## SUGGESTIONS FOR OTHER PRACTITIONERS/EDUCATORS

For students with more difficulty learning, the topics expected to be included in the Iceberg activity might be explicitly listed and students place them in the proper category.