

UNIT 5: LIFE BELOW WATER



“I really don't know why it is that all of us are so committed to the sea, except I think it's because in addition to the fact that the sea changes, and the light changes, and ships change, it's because we all came from the sea. And it is an interesting biological fact that all of us have in our veins the exact same percentage of salt in our blood that exists in the ocean, and, therefore, we have salt in our blood, in our sweat, in our tears. We are tied to the ocean. And when we go back to the sea - whether it is to sail or to watch it - we are going back from whence we came.” - President John F. Kennedy

SUGGESTED ACTIVITIES

ACTIVITY 5.1— Life Below the Water

Review United Nations Sustainability Goal #14: Life Below Water. In part it says:

“The world’s oceans – their temperature, chemistry, currents and life – drive global systems that make the Earth habitable for humankind. Our rainwater, drinking water, weather, climate, coastlines, much of our food, and even the oxygen in the air we breathe, are all ultimately provided and regulated by the sea. “

Critical Thinking #1:

Explain— using the most compelling data you can find— why this statement from Goal #14 is true:

“The world’s oceans – their **temperature, chemistry, currents** and **life** – drive global systems that make the Earth habitable for humankind.”

Critical Thinking #2:

Explain, in the form of a chart or diagram, how this statement from Goal #14 is true:

“Our **rainwater, drinking water, weather, climate, coastlines**, much of our **food**, and even the **oxygen** in the air we breathe, are all ultimately provided and regulated by the sea. “

Discuss:

- What does “sustainability” mean as it relates to our oceans?
- What does “pristine” mean?
- What would “pristine” ocean waters look like?
- When was the last time our ocean waters could be described as “pristine”?
- What are some ways that people are trying to reclaim the oceans
- Why does it matter?
- What do you think are the **five** biggest threats to the ocean, and what are your ideas on how to solve them?

According the UN Goal #14:

“Careful management of this essential global resource is a key feature of a sustainable future. However, at the current time, there is a continuous deterioration of coastal waters owing to pollution and ocean acidification is having an adversarial effect on the functioning of ecosystems and biodiversity.”

Critical Thinking:

- It is an understatement to refer to the ocean as an “*essential global resource.*” Doesn’t the survival of humanity on planet Earth depend on healthy oceans?
- The oceans are so vast, is it really possible to destroy them?
- What does the United Nations cite as evidence of “deterioration of waters”?
- What changes in human behavior are essential to preserving the health of our oceans?
- What is the root cause of *pollution and ocean acidification*?
- We sometimes hear about rising sea levels. Isn’t that a good thing?

World Economic Forum:

<https://www.weforum.org/agenda/2018/06/5-ways-we-can-improve-ocean-health/>



Resource:

SHORT VIDEO: [52 Ways to Love Water: A Poem](#)

- Now write your poem?

ACTIVITY 5.2— 16 Goals

Review the remaining [17 United Nations Sustainability Goals](#) and the global drive toward values of equity, health and well-being for all citizens regardless of where they live on Planet Earth.

- What are the 17 Sustainable Development Goals?
- What are the consistent themes in the goals as a whole?
- What does *sustainability* even mean, and why do we need goals?
- What are some target strategies to achieve those goals?
- What's the holdup?
- What happens if we don't achieve them?
- What happens if we do?

Research:

This curriculum has focused on the Blue Economy, but it also closely parallels the goals of the so-called “Green Economy.”

- What is the Green Economy?
- What are some of the stated goals of the “Green Economy”?
- How are the goals of the “Blue Economy” consistent with those of the “Green Economy?”

ACTIVITY 5.3— Earth's Report Card

The United Nations released their second [World Ocean Assessment \(WOA\)](#) in 2021. The Third Report, [Mitigation of Climate Change](#), was released in 2022. The WOA is described as:

“A collective effort of interdisciplinary writing teams made up of more than 300 experts, drawn from a pool of over 780 experts from around the world. It provides scientific information on the state of the marine environment in a comprehensive and integrated manner to support decisions and actions for the achievement of Sustainable Development Goals, in particular goal 14, as well as the implementation of the United Nations Decade of Ocean Science for Sustainable Development.”

Review and Discuss:

- What were the essential findings of the first World Ocean Assessment?
- How should their results influence the development of *Vida Azul*?
- Who was the youth representative and what were her contributions?
- How were these two reports different. How were they consistent?

Watch this 17-minute video from the United Nations which summarizes the [Second World Ocean Assessment](#).

ACTIVITY 5.4— The 5 Challenges

According to the World Economic Forum, these are [five of the biggest challenges](#) our oceans face, and what we can do to solve them.

- Climate Change
- Plastic Pollution
- Sustainable Seafood (Overfishing)
- Marine Protected Areas
- Fisheries Subsidies

Solutions:

Put five Teams together and assign each team to one of these challenges. Research the problem: the root cause, how it effects the ocean, how it effects the rest of the planet, why it is so complicated, etc.

Create a compelling visual presentation that you can share with other students. And most importantly, brainstorm solutions. There is real progress in addressing each one of these. What's the good news and who are the stars making things happen?

ACTIVITY 5.5— 8 Scientific Practices #7: *Engaging in Argument*

The *Next Generation Science Standards* identify 8 Scientific Practices used by scientists, teachers, and students. The 7th one is **Engaging in Argument from Evidence**. Not an argument like you might hear on the playground. But rather, an informed opinion that is supported by evidence.

For example:

Let's say you are confronted with a science-based question: *Are our oceans really under a serious threat from climate change?*

Our investigations should result in *claims* which are supported with *evidence* and explained through *reasoning* in a written report known as a Claim-Evidence-Reasoning method:

CLAIM

- State your answer to a question.
- State what you will prove with the evidence.
- Provide relevant background information.

EVIDENCE

- Provide the scientific data and details that support your claim.
- Give evidence from the text.
- Cite the author/article.

REASONING

- Connect evidence to your claim.
- Explain how or why your evidence supports your claim.

Practice the CER Method:

Return to the two quotes from UN Sustainability Goal #14 (*Activity 5.1*)

1. “The world’s oceans – their **temperature, chemistry, currents and life** – drive global systems that make the Earth habitable for humankind.”
2. “Our **rainwater, drinking water, weather, climate, coastlines**, much of our **food**, and even the **oxygen** in the air we breathe, are all ultimately provided and regulated by the sea.”

Choose either statement, or one specific element of either statement, and use the CER Method to argue the veracity of the concept.

ACTIVITY 5.6— The Socratic Seminar

Another strategy for engaging in productive argument is the Socratic Seminar.

There are a number of ways to conduct a “Socratic Seminar.” Here is one powerful method:

In advance of the Seminar, provide a packet of short readings to your students. They should read each one carefully, “like they would read a love letter,” writing notes and comments as they go.

Start with JFK’s quote from the beginning of Unit Five. Read the Carl Sagen quote- the “Pale Blue Dot”. Include the text of the United Nations Goal #14: Life Under Water. Then add short poems and passages that are consistent with the quotes above- maybe one from Richard Attenborough or Greta Thunberg or Jacque Cousteau. Find a movie or documentary on the oceans. Find a quote from Greenpeace or the Maritime Alliance that speaks to their mission; or a quote about the ocean from the Bible, Koran or Talmud. Students can even add their own favorite passages to the collection- from poems or songs about the sea.

Finally, include a passage that regards the climate crisis as a hoax, or an essay defending the continued use of fossil fuels.

If your class is large enough, you can divide it in half. One group will sit in a circle and participate in the discussion, while the others sit on the outside and observe. Halfway through the seminar, switch the groups. This way, the discussion is more intimate and encourages all students to contribute something.

The teacher or facilitator begins with a question (or quote). For example:

- Is President Kennedy right when he says “we are all tied to the ocean?” or
- Human activity is the single biggest threat to ocean sustainability!
- If our government leaders are not concerned... our oceans must be doing ok.

The students in the circle pick it up from there. They address each other, ask questions, and respectfully challenge differing points of view. And significantly, all comments must stem from the readings.

The teacher should monitor the discussion, make sure that all voices are heard, and keep the group on track.



Resource:

There are dozens and dozens of good examples of how to structure a Socratic Seminar with any age group or academic discipline. Just Google: “Socratic Seminar.” Here’s one example:

- [Socratic Seminar Video](#)

ACTIVITY 5.7— Life on Land: UN Goal #15

UN Sustainability Goal #15 addresses issues associated with **Life on Land**; to “sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.”

Critical Thinking:

Based on the description above, what are some of the common challenges in managing *Life on Land* and *Life Under Water*?

Culminating Project: What is Your Pollution Solution?

ACTIVITY 5.8: Identify the Problem

We must take the lead in developing real solutions to cleaning up our oceans. It's not going to happen on its own. And it's not likely to happen if we are waiting for someone else to do it.

In *Activity 2.10*, we developed a Peer Presentation to raise the awareness of others about the state of plastics in our oceans. This project is an extension of what we learned in preparation for that presentation.

THE PROJECT:

Identify one major source of pollution in the oceans (plastics, dumping, run-offs, polluted streams and rivers, carbon emissions, cruise ships, agricultural waste) and develop a viable plan for eradicating it.

Define the problem: What is the cause? What is the effect? Why did you select this particular issue to solve?

ACTIVITY 5.9: Design a Solution

Use both the **Scientific Process**... and the **Design Process** (*Activity 3.8*). Take plenty of time to think, innovate, design, prototype, and test your ideas.

NOTE:

Do some dreaming. Do some research. You may find that even your wildest ideas have already been tested. (Is the ocean sweeper such a far-fetched idea?). Or maybe your vision is for a better design... or better execution.

A 16-year old Dutch student named Boyan Slat created exactly that. Then he founded his own company called Ocean Clean Up and raised 35 million dollars through crowd funding campaigns. Today he is CEO of a company he founded called *Ocean Clean Up* and his ever-evolving sweeper has successfully harvested millions of pounds of garbage from the ocean.

When asked how he was able to create a successful device for sifting the trash from the ocean, Boyan Slat said: “You research, you test, you sometimes fail, and then you learn and you repeat until you make it work.”

READ:

- [Ocean Cleanup Launched a Plastic Catcher](#)
- [The Ocean Cleanup Successfully Collects Ocean Plastics, Aims to Scale Design](#)
- [National Geographic: Pristine Seas](#)
- [Scooping Plastic Out of the Ocean is a Losing Game](#)

WATCH:

[The Ocean Clean Up](#)
[A Circular Economy for Plastic](#)

EXPLORE :

[Our Vision for A Circular Economy](#)

ACTIVITY 5.10: Defend Your Solution

In the final week of the exercise, provide a creative forum for students to present their ideas: like a science fair, senior project, gallery walk, Ted Talk, or a colloquium with guests from the Blue Tech community. Also, give lots of thought to how you might curate and save these projects for future classes.

Review:

Go back to the “CER Method” presented in *Activity 5.5*. Use applicable elements of this method to defend your ideas, research conclusions, and proposed solutions.