# UNIT 9: THE BLUE ECONOMY

Ocean Literacy **Essential Principle of #7:**

***"The ocean is largely unexplored"***

## *6 Fundamental Concepts* that explain **Principle #7:**

**7A**. The ocean is the largest **unexplored place** on Earth—less than 5% of it has been explored. The next generation of explorers and researchers will find great opportunities for discovery, innovation, and investigation.

**7B**. Understanding the ocean is more than a matter of curiosity. **Exploration**, experimentation, and discovery are required to better understand ocean systems and processes. Our very survival hinges upon it.

**7C**. Over the last 50 years, use of ocean resources has increased significantly; the future **sustainability** of ocean resources depends on our understanding of those resources and their potential.

**7D**. New **technologies**, sensors, and tools are expanding our ability to explore the ocean. Scientists are relying more and more on satellites, drifters, buoys, subsea observatories, and unmanned submersibles.

**7E**. Use of **mathematical models** is an essential part of understanding the ocean system. Models help us understand the complexity of the ocean and its interactions with Earth's interior, atmosphere, climate, and land masses.

**7F**. Ocean exploration is truly interdisciplinary. It requires close **collaboration** among biologists, chemists, climatologists, computer programmers, engineers, geologists, meteorologists, physicists, animators, and illustrators. And these interactions foster new ideas and new perspectives for inquiries.

**Scope & Sequence: Adjust for your Grade Level**—

| K - 2 | 3 - 5 | 6 - 8 | 9 - 12 |
|---|---|---|---|

## SUGGESTED ACTIVITIES

## ACTIVITY 9.1— Ocean STEM

Review the *Fundamental Concepts* A-F listed above.

Guiding Questions:

• What is the Science, Technology, Engineering and Mathematics that has been essential in the development of San Diego over the decades since its earliest settlements?
• What are the disciplines that human beings would need to master in order to successfully build underwater communities?
• What is there still to learn about our oceans?
• What are some of the mysteries that the ocean holds for you?
• What would you add or modify about these principles to fit your definition of Ocean Literacy? Why does it matter if the general population is literate in issues related to the oceans?

**READ:** Development of the International Ocean Literacy Survey: Measuring Knowledge Across the World

**Discussion:** What are the main findings of this survey? What could we do with this information?

## ACTIVITY 9.2— "We Shall Not Cease from Exploration…"

*"We shall not cease from exploration And the end of all our exploring Will be to arrive where we started And know the place for the first time." –TS Eliot*

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**7B**. Understanding the ocean is more than a matter of curiosity. **Exploration**, experimentation, and discovery are required to better understand ocean systems and processes. Our very survival hinges upon it.

📖 **Resource:**

**Watch** the Documentary Film: Good Night Oppy

*Good Night Oppy* is a documentary about two rovers that landed on Mars and operated much longer than the scientists and engineers anticipated. Over time, they seemed to take on more human behaviors and characteristics. From their work, Earth scientists learned and discovered many new things about Mars.

**Discuss:**

• What were the robots behaviors that seemed to endear them to the engineers that created them?
• Can the exploration of Mars teach us anything about the exploration of the deepest oceans? What do the two different worlds have in common?

## ACTIVITY 9.3— The Nautilus Mission

Visit the website for the Nautilus Mission. You will discover that there is a lot of interesting and exciting content: from the strangest of deep sea creatures to WWII-era ships and planes that contribute to Hawaii's Maritime Heritage.

In the spirit of the "*flipped classroom*," students should be invited to explore the site on their own and on their own time. Use class time to come together and share their findings and impressions.

Inspired by the Nautilus Missions, create an "artistic impression" of something you learned from Nautilus.

## ACTIVITY 9.4— 8 Scientific Practices: *The Mathematics*

> **7E**. Use of **mathematical models** is an essential part of understanding the ocean system. Models help us understand the complexity of the ocean and its interactions with Earth's interior, atmosphere, climate, and land masses.

Notice that *Fundamental Concept 7E* aligns with the **5th** Scientific Practice from the Next Generation Science Standards which is **Using Mathematics and Computational Thinking**

**Activity:**

Search for examples of how scientists used mathematical models in their daily work on board the Nautilus.

• What are some examples of mathematical models that you saw on the Nautilus Mission website?
• How did those models make things clearer for scientists and students on board the research vessel?
• Design your own mathematical model to explain something you saw highlighted in one of the many Nautilus videos. Work with another student on this. Identify a video clip that you are sure no one else is going to choose to model.

## ACTIVITY 9.5— The Maritime Alliance

> **7F**. "Ocean exploration is truly interdisciplinary. It requires close **collaboration** among biologists, chemists, climatologists, computer programmers, engineers, geologists, meteorologists, physicists, animators, and illustrators."

Find examples in our community of these collaborative efforts. For example, in biotech, weather analysis, water treatment, the tuna fleet, media, etc. What is the role that each of these experts would play in helping others understand the ocean.

**Research:**

What is the mission of the Maritime Alliance?

**Invite** someone who is a member of San Diego's Maritime Alliance to talk about their role, and the role of the Alliance in the Blue Economy.

## ACTIVITY 9.6— Innovation and Tech

> **7D**. New **technologies**, sensors, and tools are expanding our ability to explore the ocean. Scientists are relying more and more on satellites, drifters, buoys, subsea observatories, and unmanned submersibles.

The Blue Economy represents an enormous scope of career opportunities that are directly related to San Diego's oceanfront (e.g., in business, education, travel and tourism, research, transportation and military, etc.)

The Maritime Alliance also has a major goal around **innovation** and **tech**.

Research some of the organizations that are a part of the Maritime Alliance. What are some of the most promising innovations that they have created to help restore the ocean?

**Imagine:**

What is that one technological innovation that you think could advance underwater exploration and our overall access to te oceans?

**Discussion:**

Fundamental Concept 7D references "subsea observatories." What would a "subsea observatory" look like? Who would work there? What have they learned?

What would be some of the most interesting aspects of working under the ocean?

What would be the scariest aspect?

## ACTIVITY 9.7— Careers in the Blue Economy (Part 2)

Review the 15 "CTE Industry Sectors" and their career pathways. Notice there are no separate categories for the "ocean sector." Actually, ocean sector jobs fit in all 15 Industries.

Look at the chart entitled "Ocean STEM and the Blue Economy." Notice all of the specific vocations in the third column from the ocean sector.

What can you conclude **from this chart** about career opportunities in San Diego's Blue Economy?

**CHART**: Ocean STEM and the Blue Economy

## ACTIVITY 9.8— One Mission…Many Pathways

Make arrangements for your students to visit several companies from within the Blue Economy. In San Diego, there are hundreds of companies from the ocean sector that belong to the Maritime Alliance. They are tech, innovation, water management, robotics, transportation, defense, aquaculture, recreation, small business, biotech, education, construction, research… and more. Contact them. Send students in small numbers. Let them spend the day and take their own notes.

When they all return to class from their field trip, create multiple ways for them to share their observations: through writing, small and large group discussion, artifacts, social media posts, etc.

A Reminder:

- We don't all have to take the same field trip on the same day.
- We don't have to learn the same things at the same time… or in the same way.
- We don't all have to show up at the classroom. At the same time. Or ever.
- We can learn anywhere.
- We are all teachers.

**CRITICAL THINKING**:

- What do all of these organizations have in common?
- What makes the organization you visited, unique?

## ACTIVITY 9.9— B CORPS

7C. Over the last 50 years, use of ocean resources has increased significantly; the future **sustainability** of ocean resources depends on our understanding of those resources and their potential.

*"I often wonder to what extent business can help society in its goals and alleviate poverty, preserve ecosystems, and build strong communities and institutions... B Lab has proven that there is a way." --Madeleine Albright, Former US Secretary of State*

**B Lab** is a nonprofit network transforming the global economy to benefit all people, communities, and the planet. "The bottom line" for most companies is reflected in profits margins. But for B Corp companies, the bottom line is **sustainable** business practices. Read about here.

**REVIEW: What is the definition of 'sustainability'?**

In **Activity 1.10** we defined it as: *"Meeting the needs of the present without compromising the ability of future generations to meet their own needs."*

• **Search** for companies and read the missions of businesses from throughout the world that are committed to sustainability.
• Look for trends in how they describe their separate missions.

**Think About it:** If you could start a B-Corp business today, what would your mission be?

**Oceanic Global** is another alliance of industries that are committed to a more sustainable planet. They have adopted the Blue Standard by which all businesses can balance their footprint in nature and protect our blue planet. Check out the Blue Standard at Oceanic Global. How does it compare with the mission and standards of B Corp organizations?

**Resource:**

B Corps: Make Business A Force for Good

## ACTIVITY 9.10— Design a Better Business Model

• Consult the 15 CTE Pathways…

**Identify** a business idea that would be consistent with the Blue Economy.

• What is the business you are designing?
• How does your business benefit from and contribute to the Blue Economy?
• What is your organization's name?
• Write a mission statement for your company.
• What are some of your company's goals?
• List 4 or 5 values you will not compromise. For example:

*"We will not put profits above the welfare of our customers."*

• Would you apply to be a B CORP organization?
• Would your business idea be accepted by B CORP? Not sure? Check out the B Corp Impact Assessment.
• Describe how your company/organization would be a model of sustainability.
• Package all of your responses and ideas into a Sustainability Action Plan.