Ocean Literacy Curriculum

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Introduction

Welcome!

Welcome to the Ocean Literacy Curriculum Toolkit! Thank you for taking an interest in the improvement of our students' ocean literacy and in the health of our environment! The Ocean Literacy Curriculum is a great way to get your students involved in their environment and teach them about how they are connected to the world around them. Focusing specifically on Ocean Literacy, students will learn the Ocean Literacy Principles, how they are connected to the ocean, and how they can help improve the health of our beautiful oceans. The Ocean Literacy Principles used in this toolkit are based off of the Ocean Literacy Principles that were developed by scientists and educators from the ocean sciences education community.

This toolkit was created by Emma Sturgill as a Girl Scout Gold Award Project. This project was sponsored by the Snohomish County Marine Resource Committee.

Overview

Description

Following the learn, explore, implement system, students will learn about the ocean literacy principles with a focus on The Sixth Principle stating that humans and the ocean are inextricably interconnected. The students will then explore their environment and discuss their findings through a project. Finally, the students will learn how to integrate what they have learned into their everyday lives.

Grade Level

This curriculum is designed for students in 7th and 8th grade. The education standards stated through the toolkit are the Washington State 7th grade core standards for science. This curriculum can be used to teach younger or older students as well but we encourage you to keep in mind that this was written for students in 7th or 8th grade. This curriculum can also be adjusted to teach clubs and/or other organizations.

Timeframe

The Ocean Literacy Curriculum was designed for three 45 minute class periods. However, the lessons are structured so that you do not have to do all of the lessons to learn the information. There are also additional project choices and worksheets to extend the unit.

Materials

Student Worksheet
Lesson Presentation
Unit Test
MyCoast App*

*Optional: for Section 3

Learning Objectives

Students will…

- Understand the Ocean Literacy Principles
- Be able to demonstrate how humans are reliant on the marine environment
- Be able to show how humans impact the marine environment
- Understand how to help protect their marine environment

Section Overviews

Section 1: Ocean Literacy Lesson Teacher Resources

The first section includes the teacher resources for the first 45 minute lesson as well as educational articles, videos and websites to aide in teaching the objectives. This section also includes speaker notes for the attached presentation that follows the lesson plan and a student worksheet with an answer key.

Section 2: Ocean Literacy Project Teacher Resources

In this section, there are directions for the project that will help the students explore the ocean and interpret what they learned in the first 45 minute lesson. Along with the rubric and directions, there is also an attached student worksheet that works with the project.

Section 3: MyCoast.org And The MyCoast App

This section includes a description of the purpose of the MyCoast App as well as a guide on how to use the MyCoast App. While this option is not required, using the MyCoast app allows the students to become citizen scientists, and gives them a way to actively contribute to marine conservation efforts.

Section 4: Knowledge Demonstration Teacher Resources

The final 45 minute lesson includes a 20 minute mini-lesson on how the students can help their marine environment and an additional presentation with speaker notes. There are two options to conclude the unit. The first option is that the students will be asked to attend a field trip to the nearest beach or make the trip individually to complete an activity with the MyCoast app. The second option is a final exam on the first lesson they learned as well as the mini-lesson they just learned. The teacher resources for both of these options can be found in this section.

Section 1: Ocean Literacy Lesson Teacher Resources

Lesson 1: Ocean Literacy

Background Information

Water is a vital part of our ecosystem and the Earth. The ocean is the biggest and most mysterious body of water on our planet and affects both the Earth and the humans in many ways. There are seven well known facts surrounding the oceans called the Ocean Literacy Principles.

Principle #1: The Earth has only one ocean
Principle #2: The ocean shapes the features of the Earth
Principle #3: The ocean influences the weather and climate
Principle #4: The ocean makes Earth habitable for humans
Principle #5: The ocean has an abundance of diverse life and ecosystems
Principle #6: Humans and the ocean are connected
Principle #7: The ocean is mostly unexplored

The Principle stating that humans and the ocean are connected is the focus of this unit. The principle is broken into five parts that explain that the ocean affects every human life, and we also affect the ocean as well, sometimes in negative ways.

The first part of the principle shows that the ocean provides freshwater and food which are both essential to the survival of all animals. The ocean is also home to photosynthetic organisms, which provide oxygen which humans breathe. Humans also use the ocean as a source of energy through dams, wind, and waves. Salt and some medicines also come from the oceans.

The second part of the principle demonstrates how the ocean also affects the distribution of humans. In history, humans built their towns or tribes around a source of water, and this affected the culture of the town or tribe. Throughout history, humans have also been using the ocean as a means of travel, warfare and trade.

The third part of the principle describes how the ocean impacts our climate. The ocean helps determine the temperature, as the oceans absorb most of the heat in the atmosphere making the earth livable for humans. The ocean can also influence humans through hurricanes, tsunamis, and other natural disasters.

The fact that human activity has an impact on the ocean is the fourth part of The Sixth Principle. Humans change the ocean landscape by building man made objects like dams, bridges and docks. Humans also pollute the ocean with trash which affects the lives of the animals in the ecosystem. As stated earlier, the ocean absorbs most of the heat in our atmosphere making Earth a livable place for humans. However, humans are at least partially at fault for the rising temperatures in the atmosphere making the ocean temperatures rise and killing many underwater species. This curriculum puts a large amount of focus on this subject.

The final part of The Sixth Principle is that individual and collective actions are necessary to conserve, maintain, and sustain a healthy ocean environment. It is important for scientists to

keep learning about the ocean and it is important for us, as individuals, to learn and spread the word about Ocean Literacy.

Vocabulary

Definitions taken from the Merriam-Webster Dictionary
Student vocabulary handout is attached

Word	**Definition**
Ocean	the whole body of saltwater that covers nearly three fourths of the surface of the earth
Literacy	the quality or state of being literate; educated
Ecosystem	the complex of a community of organisms and its environment functioning as an ecological unit
Species	a class of individuals having common attributes and designated by a common name
Extinct	no longer existing
Conservation	a careful preservation and protection of something
Principle	a comprehensive and fundamental law, doctrine, or assumption
Geology	a science that deals with the history of the earth and its life, especially as recorded in rocks
Weathering	the action of the weather conditions in altering the color, texture, composition, or form of exposed objects
Erosion	the action or process of eroding which is to wear away by the action of water, wind, or glacial ice
Tectonic Plate	the plates which float and travel over the Earth's mantle
Tsunami	a great sea wave produced especially by submarine earth movement or volcanic eruption
Atmosphere	the gaseous envelope of a celestial body (such as a planet); the whole mass of air surrounding the earth
Habitable	capable of being lived in
Photosynthesis	the synthesis of chemical compounds with the aid of radiant energy and especially light

Organism	an individual constituted to carry on the activities of life by means of parts or organs more or less separate in function but mutually dependent: a living being
Sediment	material deposited by water, wind or glaciers
Collaboration	to work jointly with others or together especially in an intellectual endeavor
Natural gas	gas manufactured from organic matter
Overfishing	to fish to the detriment of (a fishing ground) or to the depletion of (a kind of organism)
Dam	a barrier preventing the flow of water or of loose solid materials
Pollution	the act of polluting especially by environmental contamination with man-made waste
Acid rain	rain that has increased acidity caused by environmental factors (such as atmospheric pollutants)
Greenhouse gasses	any of various gaseous compounds (such as carbon dioxide or methane) that absorb infrared radiation, trap heat in the atmosphere, and contribute to the greenhouse effect; the warming of the surface and lower atmosphere of a planet
Marine biologist	a scientist who studies life in the sea

Pre-lesson Discussion Questions

This part of the lesson is optional.
Directions: Simply ask the students to discuss these questions before you begin the presentation.

1. What is the ocean?
2. Why do you think the ocean is important to our society?
3. How much do humans know about the ocean?
4. What facts do you already know about the ocean?
5. What does ocean literacy mean?

Presentation Speaker Notes

These notes are for the presentation attached to this Toolkit

Slide 1: Title Slide

- Ask the students to take notes on the presentation.

Slide 2: Ocean Literacy Introduction

- Ocean Literacy is an understanding of the ocean, how the ocean impacts humans and how humans impact the ocean.
- The Ocean Literacy Principles are seven concepts that summarize the knowledge required to understand our ocean.

Slide 3: Principle #1: The ocean has only ONE ocean

- The ocean is just one large body of water that has several names.
- Fun Fact: Some of the names of the Ocean are Pacific Ocean, Atlantic Ocean, Indian Ocean, Southern Ocean and Arctic Ocean.
- The ocean makes up 97% of the water on the planet with its own unique chemical properties.
- The size and shape of the ocean has changed overtime.

Slide 4: Principle #2: The Ocean shapes the features of the Earth

- When water meets land, it creates geologic changes like weathering and erosion.
- The land is shaped by the ocean and water like rivers, lakes and streams.
- Tectonic movement involving water and land results in volcanoes, mountains and tsunamis being created.
- Many rocks on land are formed by the ocean.
- Fun Fact: Some igneous rocks are formed in underwater volcanoes, hot spots, and mid-ocean ridges. Some metamorphic rocks are formed at subduction zones in the ocean. Many sedimentary rocks are formed from organic sediments in the ocean.

Slide 5: Principle #3: The Ocean influences the weather and climate

- The Ocean plays a large part in the water cycle as most of the rain is from the ocean.
- Fun Fact: As shown by the water cycle image, water from the ocean evaporates into the atmosphere, cools, and forms clouds with snow, rain or hail. The rain, snow or hail then falls back to Earth. This cycle has a very significant influence on the weather and climate
- The ocean absorbs most of the heat in the atmosphere.
- The global climate is influenced by the amount of CO2 in the atmosphere. The ocean absorbs about half of the CO2 in the atmosphere.

Slide 6: Principle #4: The ocean makes Earth habitable for humans

- Most of the oxygen in the air is created by photosynthetic organisms in the ocean.
- Fun Fact: Originally, the air used to be toxic to breathe until oxygen from the photosynthetic organisms made the earth livable for all organisms.
- Scientists have discovered some ancient ocean sediments that show that some of the earliest forms of life came from the ocean.

Slide 7: Principle #5: The ocean has an abundance of diverse life and ecosystems

- The ecosystems are different based on the pressure and depth, sunlight, chemical makeup and other aspects that make each ecosystem thrive.
- Ecosystems with the greatest abundance are shown where the environmental conditions allow high levels of productivity.
- The diversity in ecosystems allows for many unique life forms to thrive.
- Fun Fact: As of 2015, there were 228,450 species in the ocean with potentially 2 MILLION MORE that have not been discovered yet!!

Slide 8: Principle #6: Humans and the ocean are connected

- The ocean affects the weather and climate.
- The Earth would not be habitable for humans without the ocean.
- The ocean influences population distribution for humans.
- Human activity influences the ocean in positive and negative ways.
- Individual and collective effort is required for maintaining a healthy ocean.

Slide 9: Principle #7: The ocean is mostly unexplored

- Conditions like pressure, light, depth and temperature make it difficult to explore the ocean.
- Fun Fact: Less than 5% of the ocean has been explored!
- Collaboration and sharing of the information found in the ocean occurs on many levels including local, regional, national and international.

Slide 10: What Impact Does Our Ocean Have On Our Lives?

- Discuss question with your class.

Slide 11: The Ocean Produces What We Need To Survive

- Fishing is a large food source for humans. Humans also catch crabs, muscles, clams, and gather seaweed to eat. Some diets, like the pescatarian diet revolve around having fish instead of meat.
- Humans could not survive without water, water from the ocean that goes through the water cycle supplies humans with a large amount of freshwater for drinking and other uses.
- Photosynthetic organisms produce about half the air we breathe.

Slide 12: Humans Use Resources From The Ocean

- Some of the ingredients in some medicines come from the plants and animals in the ocean.
- Some of the energy we use is derived from the ocean. The energy sources range from wind to waves to natural gasses.
- Humans harvest Sea Salt from the oceans.

Slide 13: The Ocean Influences The Distribution Of Humans On The Planet

- Humans use the ocean for transportation.
- Ocean separates the different continents which distributes people.
- Civilizations established themselves near water, so most of our major cities are now near water as well.
- Water became a large part of culture. This included gods that were supposedly the gods of the sea and some cultures even worshipped the ocean.

Slide 14: The Ocean Influences The Weather And Climate

- The ocean absorbs and releases a lot of heat in the atmosphere which makes the earth habitable.
- Those living by the coastline may be affected by tsunamis, hurricanes, typhoons or rising sea levels.

Slide 15: What Impact Do Humans Have On The Ocean?

- Discuss question with your class.

Slide 16: Human Activity Contributes To Changes In Our Ocean

- Fishing and aquaculture if done correctly, can help the ecosystems. If done incorrectly, like overfishing, it can be harmful to the environment and can contribute to the extinction of a species.
- The introduction of non-native species, like the one below, can interrupt the food web, introduce diseases, compete for resources and lead to change in the ecosystem.
- Man-made modifications like dams affect the landscape and the species that live in the oceans and rivers. Other man-made modifications on the coastline can damage ecosystems and cause erosion.

Slide 17: Pollution and Climate Change Impact The Ecosystems and Life In The Ocean

- Trash pollutes the ocean. Often, ocean animals mistake trash for food and try to eat it, which can be deadly. Toxic substances entering the ocean can lead to the death of animals and can produce acid rain.
- Human activity creates greenhouse gasses which trap heat in our atmosphere. As we already know, the ocean absorbs most of the heat in our atmosphere. However, when the ocean warms up, it reduces the oxygen in the ocean and makes it more difficult for the fish to breathe. The rising temperatures can also kill off entire ecosystems. For example, coral reefs die when the ocean temperatures increase. This destroys not just the coral, but the entire ecosystem of life.

Slide 18: Some Human Actions Contribute To Maintaining, Conserving And Sustaining A Healthy Marine Environment

- Humans can take actions to clean up the marine environment through beach clean ups, and underwater clean ups.
- Scientists continue to learn about and study the ocean. The above image shows a marine biologist treating and restoring a marine environment.
- Teachers teach about marine conservation in schools and other organizations are spreading the word about marine conservation as well as other problems relating to the ocean.

Post-lesson Discussion Questions

This part of the lesson is optional.
Directions: Simply ask the students to discuss these questions after you finish the presentation.

1. What are some ways that the ocean helps humans?
2. What are some ways that we impact the ocean?
3. What are some real life examples of the interconnectedness between humans and the ocean that you know?
4. How do you think that you could help maintain and sustain our ocean?
5. If you were going to add another Principle, what would it be?

Resources

Websites

Link	**Description**
http://oceanliteracy.wp2.coexploration.org/ocean-literacy-framework/principles-and-concepts/?page_id=756	Describes the Ocean Literacy Principles in detail by grade level
http://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf	Describes ocean literacy principles for all grade levels
https://www.nationalgeographic.com/environment/planetorplastic/	Collection of articles describing current events involving lowering single use plastic around the world and more articles on the effects of plastic on the ocean

Articles

https://www.climatecentral.org/news/greater-barrier-reef-coral-bleaching-20267	The bleaching great barrier reef, its causes and how it will affect humans

https://www.climatecentral.org/news/in-hot-water-warming-waters-are-stressing-fish-and-the-fishing-industry-2019	How the warming waters are affecting the fish and fishing industry
https://abcnews.go.com/Technology/world-ocean-day-2019-oceans-plastics-problem/story?id=63324490	The world ocean plastic problem and ways you can help solve it
https://www.nationalgeographic.com/magazine/2018/06/plastic-planet-health-pollution-waste-microplastics/	Microplastics effect on the life in the ocean
https://news.nationalgeographic.com/2018/05/plastics-facts-infographics-ocean-pollution/	Infographics regarding plastic in the ocean

Videos

https://www.youtube.com/watch?v=DYOyn3zWz8E	Description of the Ocean Literacy Principles
https://www.youtube.com/watch?v=QltN3FjwTu0	Time lapse of the coral bleaching event around the world
https://www.youtube.com/watch?v=6HBtl4sHTqU	Garbage in the ocean and the great pacific garbage patch
https://www.youtube.com/watch?v=ju_2NuK5O-E	Plastic in the ocean and how it is affecting birds and wildlife
https://www.youtube.com/watch?v=DK5nUXkrz8o	How dams are affecting the salmon who have to swim upstream
https://vimeo.com/250627097	The removal of the Elwha dam and its effect on the surrounding area, the river, and animals that live there.

Worksheet Answer Key

The following answers are for the attached student worksheet.
Answers shown in red

Vocabulary: Answer the following vocabulary questions;
Complete the following sentence: Conservation is a careful preservation and protection of something

What is erosion?
the action or process of eroding which is to wear away by the action of water, wind, or glacial ice

What is weathering?
the action of the weather conditions in altering the color, texture, composition, or form of exposed objects

What does it mean for a species to become extinct?
The species would no longer exist

Which type of science deals with the history of the earth and its life?
Geology

Ocean Literacy: Answer the following questions;

List the Ocean Literacy Principles

1. The Earth has only one ocean
2. The ocean shapes the features of the Earth
3. The ocean influences the weather and climate
4. The ocean makes Earth habitable for humans
5. The ocean has an abundance of diverse life and ecosystems
6. Humans and the ocean are connected
7. The ocean is mostly unexplored

How might garbage in the ocean negatively affect humans?
Answers may vary

List four ways the the ocean impacts humans

1. Food and Water Source
2. Photosynthetic organisms produce about half the air we breathe
3. Some of the ingredients in some medicines come from the plants and animals in the ocean
4. Some of the energy we use is derived from the ocean

More possible answers: Humans harvest Sea Salt from the oceans; Humans use the ocean for transportation; Ocean separates the different continents which distributes people; Civilizations established themselves near water, so most of our major cities are now near water as well, Water became a large part of culture; The ocean absorbs and releases a lot of heat from the atmosphere which makes the earth habitable; Those living by the coastline may be affected by tsunamis, hurricanes, typhoons or rising sea levels

List four ways humans impact the ocean

1. Fishing and aquaculture if done correctly, can help the ecosystems. If done incorrectly, like overfishing, it can be harmful to the environment and can contribute to the extinction of a species
2. The introduction of non-native species can interrupt the food web, introduce diseases, compete for resources and lead to change in the ecosystem.
3. Man-made modifications like dams affect the landscape and the species that live in the oceans and rivers. Other man-made modifications on the coastline can damage ecosystems and cause erosion.
4. Trash pollutes the ocean which ocean animals mistake for food and choke on. Nets and plastic can holders can get caught around animals necks and kill them as well. Toxic substances entering the ocean can lead to the death of animals or even acid rain.

More possible answers: Human activity creates greenhouse gasses which trap heat in our atmosphere. As we already know, the ocean absorbs most of the heat in our atmosphere. However, the ocean warming up results in less oxygen in the ocean for the fish to breathe. The rising temperatures can also kill off entire ecosystems., Humans can take actions to clean up the marine environment through beach clean ups, and underwater clean ups., Scientists continue to learn about and study the ocean. The above image shows a marine biologist treating and restoring a marine environment., Teachers teach about marine conservation in schools and other organizations are spreading the word about marine conservation as well as other problems relating to the ocean.

What are some ways you can help your marine environment?

Answers may vary

What is an example of a negative effect climate change has on the ocean?

Answers may vary

Section 2: Ocean Literacy Project Teacher Resources

Ocean Literacy Project

Project Description

This project is designed for the second 45 minute class session. In this project, students will group up into teams and draw their ocean. The teams will then be asked to draw an initial set of ecosystems and a set of species living in each ecosystem. The teacher will then give the teams a set of prompts that will demonstrate what is currently happening in the ocean. The prompts include pollution, climate change, man-made challenges, beach cleanups, artificial reefs, and much more! Each prompt will only have a limited amount of time to draw so the students have to be quick! This project will help the students visualize what they have learned and get them to think deeper into the interconnectedness of humans and the ocean, furthering their ocean literacy education.

Materials

- One large piece of white paper (preferably 11x16) or two pieces of blank paper taped together for each team
- Pencils
- Erasers
- Student worksheets
- Timer

Directions

Split the class into teams of 3 or 4 and give each team a large piece of paper. Each member of the team should have a pencil and an eraser. Ask each team to follow the directions from each of the prompts using the attached presentation. Once each prompt is read out loud, start the timer. Once time runs out, move onto the next prompt. The design of their ocean is entirely their own and they can put each of their ecosystems wherever they would like to. However, they must understand that there is only one ocean, so there can only be one ocean in their drawing.

Prompts

Prompts match up to a presentation attached to the toolkit. While it is encouraged that teachers use the attached presentation, it is also suggested that they say the prompts outloud.

Prompt 1: 5 minutes
- To start, please draw 5 coral reef, 5 deep sea, 5 mangrove, and 5 hydrothermal vent ecosystems.
- In the Mangrove ecosystems draw 20 jellyfish, 20 oysters, and 20 snails.
- In the coral reef ecosystem draw 20 rays, 20 sea stars, and 40 fish.
- In the hydrothermal ecosystems draw 20 spider crab, 20 anemones, and 20 gastropods.
- In the deep sea ecosystem draw 20 squid.

Prompt 2: 30 seconds
- Your coral reef is thriving and spreading!
- Add 2 more reefs!

Prompt 3: 1 minute
- One mating season has passed in the reef!
- Add 10 more fish, 5 more sea stars and 5 more rays to your coral ecosystem

Prompt 4: 30 seconds
- Shrimp farmers have found 2 of your mangroves!
- Erase 2 of your mangroves

Prompt 5: 1 minute
- The jellyfish, oysters, and snails that lived in the two mangroves that became shrimp farms had to move to the next closest mangrove! Some of them unfortunately died along the way.
- Erase 10 jellyfish, 10 oysters, and 10 snails.

Prompt 6: 15 seconds
- Climate change is warming up your reefs, killing them in the process!
- Erase 1 of your reefs.

Prompt 7: 45 seconds
- The animals that lived in the reef decided not to move and died with the reef.
- Erase 10 fish, 5 rays, and 5 sea stars

Prompt 8: 30 seconds
- A mating season has passed in your mangrove!
- Add 5 jellyfish, 5 oysters, and 5 snails

Prompt 9: 1 minute
- A pipe down by one of your hydrothermal ecosystems bursts, making the animals that live there sick and die.
- Erase 10 spider crab, 10 anemones, and 10 gastropods

Prompt 10: 30 seconds
- You patch the pipe and clean up the water just in time for the mating season to pass!
- Add 3 spider crab, 3 anemones, and 3 gastropods

Prompt 11: 15 seconds
- Climate change further warms the reefs and 2 more of your reefs die.
- Erase 2 reefs.

Promt 12: 45 seconds
- The animals in these reefs decide not to move again! They die along with the reef.
- Erase 15 fish, 10 sea stars, and 10 rays

Prompt 13: 35 seconds
- A new species was discovered in the deep sea ecosystem!
- Add 20 eels to the deep sea ecosystem

Prompt 14: 20 seconds
- You discover that while your vehicles were down in the deep sea ecosystem, they accidentally brought an invasive species with them that killed off some of your eels! Unfortunately it will take some time to go down that deep again with all of the pressure and lack of light. You can't do anything for a while to stop the invasive species.
- Erase 10 eels.

Prompt 15: 25 seconds
- A mating season has passed in the deep sea ecosystem!
- Add 5 squid and 5 eels.

Prompt 16: 45 seconds
- Humans dump 2 tons of trash into your mangrove, killing some of the ecosystem by blocking the roots and killing the animals.
- Erase 2 mangroves, 10 jellyfish, 5 oysters and 10 snails.

Prompt 17: 15 seconds
- You hold a cleanup for the trash dumped into the mangroves and replant 3 mangroves.
- Add 3 mangroves

Prompt 18: 5 seconds
- Climate change makes the temperature rise again in the reef! More of your coral reef dies off!
- Erase 1 reef.

Prompt 19: 25 seconds
- You add an artificial reef made out of a sunken boat right near the dying reef and the animals living in the dying reef move there! One mating season passes for the reef ecosystem!
- Add 5 fish, 5 rays, and 5 sea stars

Prompt 20: 15 seconds
- A passing ship leaves its mark on a hydrothermal vent by introducing an invasive species that takes its toll on the animals living there.
- Erase 5 spider crab, 5 anemones, and 5 gastropods

Prompt 21: 10 seconds
- The invasive species in the deep makes you lose all of the eels that you knew existed. Eels go extinct.
- Erase all of your eels.

Prompt 22: 10 seconds

- The invasive species in the deep turns out to also be affecting the squid. You lose half of your squid!
- Erase 12 of your squids.

Prompt 23: 5 seconds

- You are now able to go down and take out the invasive species from the deep sea ecosystem. But you are not in time to save 2 squid.
- Erase 2 squid.

Prompt 24: 10 seconds

- Oil spill in your mangroves! The lack of light makes one mangrove die and along with the ecosystem went some of the animals living there.
- Erase 1 mangrove, 3 jellyfish, 3 snails and 3 oysters.

Prompt 25: 10 seconds

- One mating season passed in the mangroves!
- Add 1 jellyfish, 1 snails, and 1 oysters.

Prompt 26: 15 seconds

- Humans build a new pier which took out one of your coral reefs!
- Erase 1 reef, 8 fish, 5 rays, and 5 sea stars.

Prompt 27: 5 seconds

- Humans build another artificial reef to replace the one they wrecked. One mating season passes in the reef.
- Add 3 fish, 1 ray and 1 sea star.

Prompt 28: 5 seconds

- Trash is dumped into the ocean and ends up in the thermal vents killing some animals.
- Erase 2 spider crab, 2 anemones, and 2 gastropods

Prompt 29: 10 seconds

- Some more of the trash end up at the reefs. The fish and rays mistake it as food! As a result the fish and rays die.
- Erase 10 fish and 5 rays

Prompt 30: 5 seconds

- Climate change takes out your two remaining reefs!
- Erase 2 reefs. Coral is now extinct.

End Result

Have each team add up their remaining ecosystems and species and share them out as a class. Some teams may not come close to the actual end result and that is fine. Take a minute to discuss with the groups who came closest (for fun). The point is to show them how drastic human influence is on the ocean.

The end result should be close to the following:

Reefs: Extinct
Mangroves: 3
Deep Sea: 5
Hydrothermal Vents: 5
Rays: 6
Sea Stars: 11
Fish: 15
Artificial reefs: 2
Jellyfish: 3
Oysters: 8
Snails: 3
Squid: 11
Eels: Extinct
Spider crab: 6
Anemones: 6
Gastropods: 6

Post-Project Discussion

Have your students discuss these questions after the project is complete.

1. Why did the loss of each ecosystem affect the animals the way that it did?
2. Which Ocean Literacy Principles were shown in the project?
3. How might you have solved some of the problems that happened during the project?
4. What are some real world examples you have heard about that are similar to the prompts in the project?
5. How might the extinction of the coral affect humans?
6. What trends did you notice in the before and after statistics from the project (difference between start and end result)?

Post-Project Student Worksheet Answer Key

The following answers are for the attached Post-project student worksheet

Answers shown in red

What happened to the animals when their habitat died?

Answers may vary

Possible answer: The animals either moved or died. If they moved some died.

What could have been done to prevent some of the ecosystems from dying?

Answers may vary

Possible answers: Take away single use plastics, stop using greenhouse gasses, have more protection for reef habitats, have protected mangroves.

What did some of the humans in the prompts do to fix the situation?

Answers may vary

Possible answers: The humans put in artificial reefs for the reef animals, The humans regrew the mangroves that had been destroyed, The humans had a cleanup of the trash.

How might the extinction of some of the animals and habitats affect humans?

Answers may vary

What trends did you notice between the start end end results for each ecosystem and species?

Answers may vary

If there were more prompts, what might have happened to your ocean?

Answers may vary

Section 3: MyCoast.org And The MyCoast App

MyCoast Introduction

MyCoast is a national project that documents our beaches and what happens to them. With MyCoast, you can become a community scientist by reporting photos of beaches, large marine debris, creosote-treated debris, abandoned boats, king tides, and storm surges! The MyCoast.org website and MyCoast App allows you to share these photos with decision makers, emergency managers, and others who use the reports to make decisions. On the MyCoast.org website and on the MyCoast App, you can also view others reports, look at a tide chart for your area, look at nearby tide stations and much more!

Setting Up Your MyCoast Account

On MyCoast.org

1. In search browser go to the MyCoast.Org website
2. In the upper right hand corner, click the “Register” button next to the “Login” button
3. Fill in the information that shows up on the screen. This includes first name, last name, email, home state, and password. Writing your own bio is optional.
4. Click the “Submit” button. The next screen should be the MyCoast.org website
5. In the upper right hand corner, click the “Login” button
6. Enter your email address and password from your registration
7. Click the “Login” button.
8. Your account has now been set up! Start reporting!

On The MyCoast App

1. In your app store, install the MyCoast App by Blue Urchin
2. Open the app
3. Click the “Register” button at the bottom of your screen
4. Fill in the information that shows up on the screen. This includes name, email, password and home state.
5. Click the “Submit” button at the bottom of your screen
6. If necessary, login using the same email and password created through registering.
7. Your account has now been set up! Start reporting!

Using MyCoast

All underlined words are fill-in-the-blanks according to your situation. For example, “MyCoast: State name” means that the underlined word will be your state, or the nearest MyCoast state.

How To Submit A Report

On MyCoast.org

1. Once you are logged in, hover your mouse over the “MyCoast: state name” button
2. Move your mouse to hover over the type of report you would like to make
3. Move your mouse and click on the “Submit a report type photo” or “Submit a report type report” button
4. Fill out all of the fields on the first page and click the “Next” button
5. Fill out all of the fields on the second page and click the “Next” button
6. If necessary, fill out all of the fields on the third page if a third page appears and then submit the report

On The MyCoast App

1. Once you are logged in, make sure you are on the home page by clicking the three squiggly lines in the top left hand corner of your screen, and then clicking the “Home” button
2. At the bottom of your screen, click the “Add Report” button
3. Click on the report type that you would like to submit
4. Take the photo or select the photo from your library if asked to do so
5. Fill out all of the fields on the page and click the orange button at the bottom of your screen
6. Fill out all of the fields on the next screen and click the button at the bottom of your screen to submit the report or to go to one final screen
7. If necessary, fill out all the fields on the final screen and then hit the button at the bottom of the screen to submit the report

How To View Your Previous Reports

On MyCoast.org

1. Once you are logged in, hover over the “My Account” button
2. Click the “My Reports” button

On The MyCoast App

1. Once you are logged in, click on the three squiggly lines in the upper left hand corner of the screen
2. At the bottom of the list of options in the menu, click the “Visit MyCoast.org” button

3. Once the page loads, login if necessary by clicking the three white bars on the upper right hand corner of the screen, clicking the “login” button, entering your email and password, and clicking the “submit” button.
4. Once again, click on the three white bars in the upper right hand corner of the screen
5. Click the “My Account” button in the menu
6. Click the “My Reports” Button that drops down after the “My Account” button is clicked

How To View Other Reports

On MyCoast.org

Option 1

1. Once you are logged in, hover your mouse over the “MyCoast: state name” button
2. Move your mouse to hover over the type of report you would like to see
3. Move your mouse and click on the “Report type photo” or “Report type report” button
4. Click on a beach, click on a pin or scroll down to look at information and photos from reports other people submitted.

Option 2

1. Once you are logged in, hover your mouse over the “MyCoast: state name” button
2. Click the “Search all reports” button at the top of the list
3. Fill in the information on the screen to locate the photo or report you are looking for
4. Scroll down to see the results

On The MyCoast App

Option 1

1. On your home screen, above the “Add Report” button, there are pictures regarding recent reports posted by other people, click on one to see more information regarding the photo
2. Click on the “View Report on MyCoast.org” button at the bottom of your screen to view the full report as well as comments other people made on the report

Option 2

1. Once you are logged in, click the three squiggly lines in the upper left hand corner of the screen
2. Click on the “Live Report Stream” button to view the recent reports posted on beaches near you

How To View/Edit My Account

On MyCoast.org

1. Hover over the “My Account” button in the upper right hand corner of your screen
2. Click on the “View/Edit My Profile” Button
3. View/Edit any of the fields
4. Click the “Save Changes” button to exit

On The MyCoast App

1. In the upper left hand corner of your screen, click the three squiggly lines
2. At the bottom of the list of options in the menu, click the “Visit MyCoast.org” button
3. Once the page loads, login if necessary by clicking the three white bars on the upper right hand corner of the screen, clicking the “login” button, entering your email and password, and clicking the “submit” button.
4. Once again, click on the three white bars in the upper right hand corner of the screen
5. Click the “My Account” button in the menu
6. Click the “View/Edit My Profile” button that appears after the “My Account” button is clicked
7. View/Edit any of the fields
8. Click the “Save Changes” button to exit

How To Log Out

On MyCoast.org

1. Hover your mouse over the “My Account” button in the upper right hand corner on your screen
2. Click the “Log Out” button at the bottom of the drop down list

On The MyCoast App

1. Click the three squiggly lines in the top left hand corner of your screen
2. Click the “Settings” button
3. Click the “Log Out” button

Section 4: Knowledge Demonstration Teacher Resources

Lesson 2: How H(YOU)mans Can Help The Ocean

Pre-Lesson Discussion Questions

1. In Lesson 1, we discussed some of the effects humans have on the ocean. What were some negative effects humans have on the ocean?
2. What are some ways the government can help fix those problems?
3. What are some ways communities can help solve these problems?
4. What are some ways individual companies like grocery stores can help solve these problems?
5. What are some ways you can help solve these problems?

Mini-Lesson Presentation Speaker Notes

Slide 1: Title Slide
Slide 2: Reduce The Effect Of Climate Change
- Use energy efficient appliances
- Turning off the lights when the room is not in use
- Taking alternative modes of transportation like walking or bicycling
- Using public transportation or carpooling

Slide 3: Reduce Pollution
- Recycle
- Use biodegradable products
- Don’t litter

Slide 4: Reduce Overfishing And Habitat Destruction
- Buy and eat only seafood caught through sustainable means

Slide 5: Reduce Non-Native Species
- Don’t release unwanted water, plants, or animals collected from other ecosystems
- Don’t dump ballast water from boats

Slide 6: Spread Your Knowledge
- Share what you learned with other people and help reduce human impact on the ocean

Slide 7: Organize Or Attend A Beach Cleanup
- There are hundreds of organizations dedicated to cleaning up the ocean and they need a hand! Or a thousand hands! Or more!
- Some organizations are…
    - Surfrider foundation
    - Puget Soundkeeper Alliance

    - As well as other individuals in your community

Slide 8: Choose a Cause to Contribute to!

- Look for marine animals in your area that need your help!

Slide 9: For example: Orcas

- Develop an appreciation for the Salish Sea and beyond!
    - Use the MyCoast app and become a citizen scientist
- Switch to natural cleaners!
    - Look for the words WARNING, CAUTION, DANGER or POISON on your cleaning products at home.
    - Try to make your own cleaning products
- Reduce your use of plastic
- Help reduce stormwater pollution
    - Pick up after your pets!
- Eat sustainable seafood
- Learn to be Whale Wise
    - Learn about how we affect the Orcas and what we can do to reduce our impact, then, spread the word!
- Support funding for salmon habitat restoration
    - Use your voice to advocate for the Orca's food source!
- Get involved in local restoration work

Slide 10: Ending Slide

- Continue to help the ocean and look for ways you can help scientists as well through MyCoast.org or MyCoast App!

Post-Lesson Discussion Questions

1. What are some things that you personally could change in your daily routine to help our marine environment?

2. Does anyone here do any of these things listed in the unit? If you do, what are they?

3. Has anyone heard of any companies near us who have stopped using single use plastics?

4. Are there any more organizations that are local that you can think of that focus on the health of the marine environment?

5. Is there anything else you could think of that would help our marine environment?

Option 1: Field Trip

Overview

Arrange for a field trip for your class or assign this as an individual assignment. Have all of your students go down to the nearest coastline and become community scientists by taking pictures of the coastline and reporting it on MyCoast.org. Then, have them look at pictures posted by others and have discussion regarding changes they see and what could have caused them. They will also get a chance to review the things they learned from the first lesson through the discussion questions. Grade them based on their analysis of the photos and their participation in the discussion.

Directions

Give each of the students the student directions handout with directions on how to use MyCoast.org and the directions for the project. Ask them to follow the directions and find a report from the same coastline and try to match the picture with the exact place and then report it in MyCoast.org. Then ask the students to compare the two photos and look for changes in the beachline including tide, trash, debris and other details. Have them analyze on a separate piece of paper what is different and what could have caused it. Then ask them to look around and see if they see any trash, if they do, pick it up and ask them to count how much they found. Remind them that most litter in the ocean is very, very small. Small pieces are easier for marine animals to ingest, which can damage their health or kill them. Ask them to be sure to collect small pieces of glass or plastic, and not just focus on the big ones. This will get them to think about how much impact humans have on the coastline and demonstrate their collected knowledge from the past few sessions.

Discussion Questions

1. What changes did you notice between the other report and your report?
2. What do you think caused those changes?
3. Were some of the changes human influenced?
4. What do you think this beach will look like in the future?
5. How many pieces of trash did you find?
6. What were the most common types of trash?

7. Why do you think it was mainly that kind of trash?
8. What impact would the trash found have on some of the animals living around your coastline?
9. What were some of the Ocean Literacy Principles you observed?
10. Do you think you going to the coastline every once in a while and picking up trash will help the ocean? Why or why not?
11. What can you do in the future to further help the ocean?
12. How might the ocean influence the weather in your area?
13. Looking at how the ocean can change the landscape, what do you think the earth will look like in the future?

Option 2: Final Test

Final Test Answer Key

These answers match up to the Ocean Literacy Unit Final Test attached to this toolkit.
The answers are in red.

What is ocean literacy?
Ocean Literacy is an understanding of the ocean, how the ocean impacts humans and how humans impact the ocean.

What are the seven Ocean Literacy Principles?

1. Principle #1: The Earth has one big ocean with many features
2. Principle #2: The ocean and life in the ocean shape the features of Earth
3. Principle #3: The ocean is a major influence on the weather and climate
4. Principle #4: The ocean makes the earth habitable
5. Principle #5: The ocean supports a great diversity of life and ecosystems
6. Principle #6: The ocean and humans are inextricably interconnected
7. Principle #7: The ocean is largely unexplored

How does the ocean affect our climate and weather?
The Ocean plays a large part in the water cycle as most of the rain is from the ocean. The ocean absorbs most of the heat in the atmosphere. The global climate is influenced by the amount of CO2 in the atmosphere. The ocean absorbs about half of the CO2 in the atmosphere.

What are some geological changes created by the ocean meeting the land?
When water meets land, it creates geologic changes like weathering and erosion

How does the ocean influence the humans? List at least 5 ways.

Possible answers: Humans obtain food from the ocean through marine life, Humans need to drink fresh water to survive, Photosynthetic organisms in the ocean produce most of the oxygen that humans use, Humans use resources from the ocean to make products, medicine and other consumer goods, Humans use the ocean to obtain energy, Humans extract salt from the oceans, The ocean influences the population distribution of humans

How do humans influence the ocean? List at least 5 ways.

Possible Answers: Fishing and aquaculture if done correctly, can help the ecosystems. If done incorrectly, like overfishing, it can be harmful to the environment, The introduction of non-native species, Man-made modifications, Trash pollutes the ocean. Toxic substances entering the ocean can lead to the death of animals or even acid rain, Human activity creates greenhouse gasses which trap heat in our atmosphere. The rising temperatures can kill off entire ecosystems, Humans take actions to clean up the marine environment through beach clean ups, and underwater clean ups, Scientists continue to learn about and study the ocean. Teachers teach about marine conservation.

List some ecosystems found in the ocean. List at least 3.

Possible Answers: Coral Reef, Mangroves, deep sea, thermal vents, salt marsh, estuary, lagoon

What is erosion?

the action or process of eroding which is to wear away by the action of water, wind, or glacial ice

What is weathering?

the action of the weather conditions in altering the color, texture, composition, or form of exposed objects

How does garbage in the ocean negatively affect the animals in the ocean?
Trash pollutes the ocean. Ocean animals mistake for the trash for food and try to eat it. It can cause them to choke, be poisoned, or become ill. Nets and plastic can holders can get caught around animals necks and kill them, as well.

What are some ways we can help the ocean and reduce the negative impact humans have on the ocean? List 6 ways.

1. Use energy efficient appliances
2. Turning off the lights when the room is not in use
3. Taking alternative modes of transportation like walking or bicycling
4. Using public transportation or carpooling
5. Recycle
6. Use biodegradable products

Possible Answers: Don't litter; Buy and eat only seafood caught through sustainable means; Don't release unwanted water, plants, or animals collected from other ecosystems; Don't dump ballast water from boats; Spread your knowledge; Organize or attend a beach cleanup

What is an example of a negative affect climate change has on the ocean?
Coral reefs die when the ocean temperatures increase, causing the loss of an entire ecosystem.

Bonus Question:

How much of the ocean has been explored?

a. > 5%
b. < 5%
c. > 10%
d. None of the above