

Atong Kadagatan, Atong Kinabuhi, Atong Ampingan
Our Ocean, Our Lives, Let's Take Care of It.

Module 1. Atong Kadagatan, Our Ocean, Our Home

Background

“The homeland is a space in time that involves geography, history, and culture.”
– Paulo Freire, *Pedagogy of the Heart*.

There are over 90 million Filipinos in the Philippines. They live in a rainbow of cultures in an archipelago of 7,107 islands, 175 languages, and over 300 dialects. Many identify themselves as Ilokanos, Visayans, Tagalogs, Ilonggo and many other ethnic groups. As of 2011, over 2 million sought work overseas because of high unemployment rates. Millions more have left for good, now calling countries such as the United States “home away from home.” The distance away from their homeland only makes these Filipinos yearn more for it. They dream of warm tropical weather, good traditional food, and endless beaches. The call of the old country is always hard to resist. They always come back whenever they can.

It is not the island paradise, though, that greets every *balikbayan* or one who returns home. The international airports in the metropolises, the first thing they see upon their arrival, are like any other in the global south. It is littered with skyscrapers and billboards next to poverty-stricken slums. This glaring disparity is a result of a complex history involving centuries of Spanish, American, and Japanese colonial rule, and continuing corruption. However, as these Filipinos leave the city behind, the landscape gradually transforms into a relaxed and slow-paced countryside. The ride home is usually a drive along a coastal highway, and this is when the overwhelming presence of the sea becomes apparent. It is a sneak peak into the treasures of the Philippines.

Many Filipinos live along coastal communities, which have very high concentrations of marine biodiversity. Most of this biodiversity is found along shallow coastlines consisting of six major ecosystems: coral reefs, mangroves, beach ecosystems, estuaries, lagoons, and seagrass beds. These areas are hosts to thousands of species of fish, clams, snails, corals, and many other marine organisms.

The Philippine marine ecosystem is quite special. John W. McManus of the Rosenthal School of Marine and Atmospheric Science (RSMAS) at the University of Miami, Florida, states that the Philippines, especially the Visayas, is the epicenter of marine biodiversity in the world. It has at least 3 to 5 times more species of fish, corals, and many other groups of organisms than those found in the Caribbean, Tahiti or Hawai'i. Only the most northern part of the Great Barrier Reefs in Australia has more reef species than the Philippines (Alino et al., 2002).

The Philippines is home to five percent of the total global area of coral reefs. They have been described as a breathtaking explosion of colors and

vitality. To Filipino fishermen and their families, this is part of their home and their means of survival. To divers and snorkelers, it is an awe-inspiring and moving experience. As Yasmin D. Arquiza and Alan T. White write in *Tales of Tubbataha*:

“Like a mirage rising out of the vast Sulu Sea, the shallow reef flats of Tubbataha slowly emerge as a white line on the horizon. It is a welcome sight to travelers who have sailed the open sea and seen almost nothing but water for the past 12 hours. As the line draws nearer, emerald waters reveal a marine paradise where colorful fish and marine critters play among corals of various hues and shades. Donning mask and snorkel, swimmers feast their eyes on underwater gardens so full of life, they could aptly be called the marine version of tropical rainforests.”

It is no wonder that many Filipinos all over the globe come home whenever they can to be with their beloved Philippines.

Lesson 1: Learning about our Ocean and its Resources

Subjects: Social Studies, Science, Language Arts, Social Sciences, Arts & Humanities, Ed. Technology

Target Audience: Grade: 6-8, 9-12

Brief Overview:

In our mobile and global society where mass culture is readily accessible, indigenous practices that honor the environment are seen as old fashioned and charming ideas rather than practical ones. As a result, more and more people are becoming very disconnected from nature and the outdoors. In this lesson, students learn to value their natural and cultural world of which they are a part. They find a personal connection and meaning in reconnecting to their local and natural history.

Keywords:

Ocean, Sea, Environment

Objectives:

- Students differentiate between the terms ocean, sea, environment, conservation, sustainability.
- Students take an active role in the stewardship of one's community.
- Students learn to work collaboratively with their peers.
- Students demonstrate abilities to research and compare information about oceans.

- Students correctly locate oceans on a world map.

Standards:

National Council for Social Studies (NCSS)

- Time, Continuity, Change
- Culture
- Individual Development and Identity
- Science, Technology and Society

Common Core State Standards (CCSS)

- English Language Arts
- Science and Technical Subjects

Materials Needed:

A world map or globe, computers with Internet access or library resources, paper, pens, pencils, poster board, and PowerPoint software (optional)

Procedure:

1. Students define and discuss the terms ocean, sea, environment, conservation, sustainability. Have them provide examples.

Ocean: The vast body of salt water that covers 71 percent of the Earth's surface and contains 97 percent of the planet's water.

Sea: A large body of salt water in an inland location that may or may not be connected to the ocean. For instance, the Philippine Sea is connected to the Pacific Ocean. It may also be a large salt-water lake such as the Caspian Sea with no natural outlet.

Environment: The surroundings, which include living (animals, plants) and non-living (rocks, minerals, temperature) things that affect the survival and development of an organism or population. It may be regarded as the natural environment or man-made environment. The environments may also be viewed as marine (water), atmospheric (air) or terrestrial (land) depending on their physical attributes.

2. Students identify the oceans of the world and locate the ocean closest to their ancestral country on a map. What do they know about this ocean? What are they proud about regarding this area?

3. A big part of Filipino culture is working together in the **bayanihan** spirit (to work together as one community). Divide students into six groups. Each group researches two oceans. The ocean pairings are Arctic-Atlantic, Arctic-Indian, Arctic-Pacific, Indian-Atlantic, Indian-Pacific, Atlantic-Pacific.

4. Students will research and write reports about the oceans. These are some of the questions they may choose to answer: How are they similar?

How are they different? Where are they located? What is its history and economy? What are the landmasses (islands), bordering countries, and territories? Who are the indigenous people within its borders? What are their livelihoods?

5. Students may use library sources or Internet sites.

Assessment:

Students create a large poster with an outline of the world map. Have them label all the oceans of the world. Make sure that they include all the names of the islands within its borders, the countries along its edges, and its indigenous people. Students write down the livelihood of the people. Have them discuss the interconnections between the oceans and the people living in them.

Lesson 2. My Ecosystem

Subject: Science

Target Audience: Grade 6-8, 9-12

Brief Description:

An **ecosystem** is a community of living (biotic) and non-living (abiotic) things interacting with each other. An ecosystem does not have a particular size. It has a **carrying capacity**, which means that there is a limit of organisms it can support. Ecosystems are important habitats for many organisms.

A **habitat** is sometimes confused with ecosystems. A habitat is a natural environment where organisms live. It is found within an ecosystem. An ecosystem, therefore, is much larger than a habitat. It is where all organisms living in different habitats interact with each other. These organisms also interact with non-living things such as sunlight, rocks, minerals, and temperature. This lesson introduces students to the concept of ecosystems and serves as an introduction to the coastal ecosystems in the Philippines.

Keywords:

Ecosystem, Biotic, Abiotic, Producers, Consumers, and Decomposers, Carrying Capacity, Habitat

Objective:

- Students will learn and understand the concept of an ecosystem.

Standards:

Common Core State Standards

- English Language Arts
- Science and Technical Subjects

Materials Needed:

Pen/pencils, paper, colors

Procedure:

1. Students discuss the term “ecosystem.”
2. Students analyze the components of an ecosystem.

These are the major components of an ecosystem.

- a. **Biotic factors:** Living things (i.e. plants and animals)
 - b. **Abiotic:** Non-living things (i.e. rocks, minerals, air, light, water, temperature, soil)
 - c. **Producers** (i.e. Plants). Organisms that make their own food using light energy from the sun or chemical energy. Producers are eaten by consumers. They are at the bottom of the food chain.
 - d. **Consumers** (i.e. Animals). Organisms that generally feed on other organisms because they lack the ability to make their own food.
 - e. **Decomposers** (i.e. Bacteria, Fungi, Worms). Organisms that break down dead or decaying organisms to help carry out the natural process of decomposition.
 - f. **Sunlight:** The source of energy for many organisms.
3. Students divide into pairs. They will create an imaginary land or body of water. They will then develop a new ecosystem based on the local environment.
 4. Students can choose as many animals and plants as they want, but need to be reminded that the ecosystem must have enough resources (food, water, shelter) to keep them alive. They will check that it contains the correct components of an ecosystem (sunlight, producers, consumers, decomposers, biotic, and abiotic factors).
 5. Students brainstorm on how to design their ecosystems. They will discuss all the local animals and plants that are included in it.

Assessment:

Students develop a plan on how to make their ecosystems as functional and as close to nature as possible. What are the key factors that make their ecosystem livable? Describe the balance within the ecosystem. Who feeds on whom or what? Discuss the food chain.

Lesson 3. Investigating the Philippine Coastal Ecosystems

Subject: Science, Social Science

Target Audience: Grade 6-8, 9-12

Brief Description:

Many Filipinos live along coastal communities, which have very high concentrations of marine biodiversity. Most of this biodiversity is found along shallow coastlines, which consist of coral reefs, mangroves, beach ecosystems, estuaries, lagoons, and seagrass beds. These areas are important habitats for thousands of species of fish, clams, snails, corals, and many other marine organisms.

Keywords:

Coral reefs, mangroves, beach ecosystems, estuaries, lagoons, and seagrass beds

Objective:

- Students will learn about the different ecosystems in a tropical marine coastal environment.
- Students will learn how to compare and contrast between ecosystems.

Standards:

Common Core State Standards

- English Language Arts
- Science and Technical Subjects

Materials Needed:

Pen/pencils, paper, colors

Coastal Resource Management Project's (CRMP), "Understanding the Philippine Coastal Environment: An Endangered Coastal Environment"

http://www.oneocean.org/about_crmp/coastal.html#mangroves

Procedure:

1. Read Coastal Resource Management Project's (CRMP) "Understanding the Philippine Coastal Environment: An Endangered Coastal Environment"
http://www.oneocean.org/about_crmp/coastal.html#mangroves
2. Before reading, students comment on the illustrations of the different coastal habitat or ecosystems. What do they see?
3. Read the article. What are the five habitats/ecosystems described in the article? How are they important to the coastal communities of the Philippines?

4. Students fill out a data retrieval chart based on the CRMP article and individual research using library and Internet resources.

Coastal Habitat/Ecosystem	What are the main characteristics of this ecosystem?	What kinds of organisms can be found here?	How are they important to coastal communities?	What are the types of human impacts and threats on this ecosystem?
Coral reef				
Mangroves				
Beach systems				
Brackish wetlands				
Seagrasses				

Assessment:

Students choose a coastal environment closest to their hometown. Have them conduct a research on this particular place. They will then write a comparative report between this environment and the Philippines’ coastal environment. They will use the questions on the data retrieval chart to make their comparisons.

Lesson 4. Is my Ecosystem Healthy? A Lesson on Biodiversity

Subject: Science, Social Science

Target Audience: Grade 6-8, 9-12

Brief Description:

John W. McManus of the University of Miami, Florida, calls the Philippines the epicenter of marine biodiversity in the world, but what does biodiversity mean? Biodiversity is the sum of the variety of living things in an ecosystem. When an ecosystem is rich in biodiversity, it is an indication that it is in a balanced state with the different interacting organisms. When the number of organisms decreases or mutates, it shows that it is not doing well. It could be reacting to different factors, such as pollution, loss of habitat, effects of drought or other weather conditions.

Keywords:

Biodiversity, Mutation, Pollution, Indicator species

Objective:

- Students will learn about the concept of biodiversity.
- Students will be introduced to environmental issues such as pollution.

Standards:

Common Core State Standards

- English Language Arts
- Science and Technical Subjects

Materials Needed:

Pen/pencils, paper, colors (optional), large sheet of paper, notebooks

Procedure:

1. Students define and discuss the terms biodiversity, pollution, mutation, and indicator species. Have them provide examples.
 - (a) **Biodiversity:** The sum of the variety of living things in an ecosystem.
 - (b) **Pollution:** The introduction of chemicals that can cause change in an environment.
 - (c) **Mutation:** When an organism changes and loses its original form.
 - (d) **Indicator species:** Organisms that are first to die when the environment starts to change. For example, scientists call frogs indicator species because they are very sensitive animals. They can breathe in harmful toxins through their skin. Frogs are the first to die when exposed to these toxins. Similarly, certain species of butterflyfish may be indicator species on coral reefs. They are found abundantly in coral reefs. The reefs may not be doing well if the population of butterflyfish drastically changes.
2. Students find an example of an aquatic environment (marine or freshwater) that is part of a larger ecosystem in their community. It must have different species of plants and animals.
3. They can call a local environmental agency for suggestions or to request a guided tour.
4. Students write a list of what they expect to see by using their own assumptions, by conducting a preliminary research using the library or internet resources or by consulting a local naturalist. Have them research and determine the indicator species of the area.
5. Students go on a field trip to this location.
6. They divide into pairs and study an area a square meter in size. The size

can be larger (10 square meters) for larger groups.

7. Students describe this area by using the major components of the ecosystem (biotic, abiotic, producers, consumers, decomposers.)
8. Students record all the plants and animals in their designated area. If they are going into the water, make sure that they have consulted an experienced naturalist or guide. Practice safety first.
9. Gather all the students together and on a large sheet of paper, have them list all the animals and plants they found. Include all animals and plants that the students have seen in past experiences in the ecosystem.
10. Students will divide into pairs and choose an organism. They will make a list of all the interactions that that organism may have in the ecosystem.
11. Students find other pairs working on a similar organism. Share the possible interactions these organisms may have.
12. **Is my ecosystem healthy?** Let's check for **biodiversity**. A wide range of organisms present in an ecosystem is a sign that it is healthy. It has enough resources to support them.
13. The class discusses the list of things that need to happen over the next 50 years for the ecosystem to sustain itself in its current state. What are the possible threats to the stability of this ecosystem? Students describe their observations and the things they did not expect. How does this ecosystem differ from the coastal ecosystems of the Philippines?

Assessment:

Students work in groups or in pairs. Have them identify the ecosystem in which they live. These are some questions to consider. Is their ecosystem healthy? Are their threats to the stability of their ecosystem such as pollution and other harmful human activities? If so, write a report outlining the problems that are causing the instability of their ecosystem. Students then write a plan of action or set of goals on how to help solve these problems. Make sure to include their personal role in achieving a healthy ecosystem or environment.

Lesson 5. Discovering Philippine Coral Reef Ecosystems

Subject: Science, Social Science

Target Audience: Grade 6-8, 9-12

Brief Background:

Coral reefs have often been referred to as the “rainforests of the ocean.” They are very important to mankind for many reasons. They provide shelter and food for marine organisms, which in turn feed millions of people worldwide. Fishing communities rely heavily on their resources for their livelihoods. Coral reefs also protect coasts from strong currents and high waves, and they control carbon dioxide in the water that could be dangerous to marine life at high levels.

The Philippines is home to five percent of the total global area of coral reefs. They have been described as a breathtaking explosion of colors and vitality. To Filipino fishermen and their families, this is part of their home and their life. To divers, it is an awe-inspiring and moving experience.

Objectives:

- Students learn about the corals.
- Students understand coral reefs as an ecosystem.

Standards:

Common Core State Standards (CCSS)

- English Language Arts
- Science and Technical Subjects

Materials Needed:

None

Keywords:

Corals, Coral reefs, Polyps

Procedure:

1. What are coral reefs? Are they vegetables? Animals? Minerals? What have students heard about them?
2. Students read the paragraphs on corals and discuss what they are.

Corals are responsible for building coral reefs. **Coral reefs** are underwater structures made of limestone or calcium carbonate. They provide homes and living space for the hundreds of thousands, if not millions, of animals that live in coral reef ecosystems.

Corals are strange little creatures. Many people think they are plants because they are stuck to the seabed. In fact, famous scholars in the late 1600’s described them as “stone plants” because they resemble rocks. They are hard and solid, but it was not until the 1730’s that the scientific community accepted them as animals.

Corals are actually made up of millions of colonies of tiny animals called **polyps**. They belong in the phylum cnidaria (nahy-dair-ee-uh) just like

jellyfish. Coral polyps mate by releasing eggs and sperm into the water. When an egg and a sperm meet, a larva known as planula soon forms.

The baby coral looks like a tiny jellyfish. It floats around in the water searching for a hard surface to land. It usually ends up in a coral reef where it attaches. Once it is securely attached, the coral starts building a limestone shell around its body. This shell is shaped like a round vase. At night when it is ready to feed, it sticks its tentacles out of the shell and let them sway with the current. The coral polyp stings plankton that are floating by with their tentacles and brings them into the shell.

3. Students learn more about coral reefs by exploring Tubbataha Reef, Apo Island, and Cebu and Bohol Islands found on the “I AM A STUDENT” webpage. Have them play the games to get them acquainted with the Philippines’ marine life.
4. In the virtual activity, Tubattaha Memory Game, students sharpen their memories by matching the fishes of Tubbataha National Marine Park.
5. Students listen and practice the local names of the fishes in the Cebuano Language in the Apo Island “Say My Name Activity.”
6. The Cebu Island and Bohol Island jigsaw puzzles help students cultivate persistence and patience while learning about the marine environment of the Central Visayas.
7. Students then describe how they felt after looking at the coral reefs. What interests them about these reefs and the marine organisms living in them?

Assessment:

Students conduct research on the Great Barrier Reefs, Tubbataha Coral Reefs, and the Red Sea Coral Reefs. Have them fill in the data retrieval chart below with their research. What are the differences and similarities between these coral reefs?

Coral Reef	Great Barrier Reefs	Tubbataha Coral Reefs	Red Sea Coral Reefs
Where is it located? What is the climate in this area?			
How big is this reef?			

Why is this reef important?			
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Lesson 6: Sea Hunt: Coral and Kin in Philippine Waters

Subject: Science, Social Science

Target Audience: Grade 6-8

Brief Background

Coral reefs are breathtaking explosion of colors. These colors mirror the patterns and hues of all the organisms living in them. This lesson explores the theories behind the coloration and patterns in coral reef fishes.

Objectives:

- Students learn about the theories explaining the importance of color and patterns in coral reef fishes.

Standards:

National Council for Social Studies (NCSS)

- Individual Development and Identity
- Science, Technology and Society

Common Core State Standards

- English Language Arts
- Science and Technical Subjects

Materials Needed:

Paper, pen/pencil, colors

Keywords:

Coral reefs, Camouflage, Countershading, Nocturnal, Flash coloration

Procedure:

1. Students discuss the theories explaining the uses of color and patterns in coral reef fishes.
 - a) Camouflage – camouflage is a way for reef animals to avoid predation or help capture a prey.

- b) Warning – certain color patterns can serve as warning to potential predators. Brightly colored fish are some of the most venomous organisms in the reef (lionfish).
- c) Advertising – unique colors and behaviors for some animals advertise their unique function such as performing necessary service to other animals on the reef (cleaner wrasse).
- d) Countershading – common among fish that swim out in the open (shark). Sharks have a darker dorsal (top) side and lighter ventral (bottom) side. To an organism looking down, the shark will blend in with the darker water, while organisms from below will have difficulty picking the animal out against the lighter surface waters above.
- e) Nocturnal - many nocturnal (night-time) fish are red. Red, the first wavelength of light to be absorbed underwater, disappears under low levels of light. It practically makes a fish invisible (lionfish).
- f) Sexual - this may be the most significant reason for the various color patterns in the reef. Males intensify their color patterning to attract a mate or when protecting nest areas.
- g) Misdirection - predators always attack from behind, which involves identifying the organisms' front and back. In fish logic, find the eyes then you will find the front. Some reef fish have false eyespots at the other end of their bodies and hide the location of their eyes with eyebars (longnose butterfly fish).
- h) Flash coloration – many reef fish have vertical barring patterns (blackfin barracuda). These patterns may help predators form a search image: food = black and white vertical bars. When the predator attacks, the prey flees and suddenly its search image has disappeared (black and white bars, when moving fast, appear as a solid gray).

2. In the Virtual Activity, *Reef Fish Name Game*, students match the correct names to the different coral reef fishes. Students then observe their colors and different patterns.

Assessment:

Students create their own coral reef ecosystem. This ecosystem includes predators, prey, and other sources of food. Students then create a fish that is highly adapted to this ecosystem. Have them present their creation to the class and explain the unique characteristics of their fish.

Resources:

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