The Galapagos Islands: A Magical Place

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"When traveling in unfamiliar territory, explorers frequently consult their compasses to insure they have not lost their way or are not headed in a direction away from their destination. The value of a compass is that it defines one direction—north. All other directions can be determined and selected or rejected based on this knowledge.
As educators, we also need to consult our professional compass. Rather than showing north, our compass needs to point directly at helping students learn." (Taken from The Master Teacher, Inc.) This study of the Galapagos Islands hopes to excite, motivate, and challenge students. We will be explorers of a wonderful unique place on earth.

Summary of Unit

My Fulbright Hays project will be a study of endemic animals of the Galapagos Islands and will be taught to the second graders of my elementary school. A mini lesson will be shared with grades 3-5.
The main focus is the adaptations these animals have made over the millions of years they have been on the islands. We will compare Galapagos animals to their South American relatives and discover how and why they evolved. The emphasis will be questioning their need to change. The formation of the islands and theories on how the animals got there will be examined.
This unit will introduce Charles Darwin to my students with exploration of his findings and conclusions. The animals of concentrations will be the Galapagos tortoises, blue-footed boobies, marine iguanas, Galapagos penguins, and flightless cormorants.
Animals of the Galapagos Islands will be a thematic unit of a larger course of study. Previous to this unit I will introduce Ecuador to my class as it relates to my Fulbright trip. The history, geography, government, language, religion, art, music and customs of Ecuador will be studied. We will do map work showing the distance from Ecuador to the Galapagos Islands, the position of the equator, the influence of currents along the Pacific coast, etc. The class will be familiar with the other 3 regions of Ecuador: the coastline, highlands, and Oriente (Amazon). In addition, we will write checks to the airlines for our tickets, learn some basic language phrases and words, make a replica of the country flag, and read numerous books, including folktales and stories, that I purchased in Ecuador. Artifacts from the various regions will be of special interest.

Key Questions: Galapagos Islands and Animals

1. How did the Galapagos Islands come into existence?
2. How old are the islands?
3. What are some theories of how the animals got to the Galapagos Islands?
4. What kinds of animals and plants are endemic to the islands?
5. How do species become endemic?
6. What kind of special adaptations do these animals have?
7. Why was Charles Darwin important?
8. What are some ways to protect the animals and islands?

A Sampling of Vocabulary Words to be Introduced

1. adaptation: plants and animals gradual change over many years
2. algae: plant-like organisms that have no root, stem or leaf
3. archipelago: a chain of islands
4. bio diversity: variety of different life forms living in an area
5. endemic: found no where else on earth
6. feral: escaped from domestication and have become wild
7. lava: molten rock that flows from volcanoes
8. mainland: the major land mass of a country or continent
9. organism: a plant or animal

Background Notes of the Galapagos Islands and Animals

The Spanish Explorers gave them the name *Las Islas Encantadas* or the Enchanted Islands.
The word *Galapagos* means tortoise.

A. **Location of the Galapagos Islands:**

The Galapagos Islands are 600 miles off the coast of South America, in the Pacific Ocean. They are one of the four regions of Ecuador, and are located on and near the equator. There are 13 major islands and many smaller ones.
The waters surrounding the islands are relatively cool, average 72 degrees Fahrenheit. The Humboldt Current, which is the flow of ocean waters starting in Antarctica and traveling up the Pacific coast of South America, brings this cooler water to the islands.

B. **Formation of the Islands:**

The islands were formed by volcanoes that bubbled up out of the ocean millions of years ago. Lava slowly built up underwater and escaped from inside the earth's cord. This formed undersea mountains. As the lava continued to build, the lava tops broke through the water and formed islands. The oldest islands are thought to be three to four million years old. The islands are still forming for there was a recent eruption and lava flowed down the side of the island and into the ocean. A chain of islands is referred to as an archipelago.

C. **How Plants and Animals Got to the Islands:**

There are theories of how this happened. Seeds from plants could have traveled through the air or they could have floated in the ocean and landed on the islands. Seeds may have stuck to the wings of birds. Some seeds were probably eaten by birds on the mainland. The birds flew to the islands and then pooped out the seeds. These plants found a way to grow.
Sea turtles and sea lions could swim to the islands. Iguanas probably floated on a log of tangled weeds or large pieces of wood. The Galapagos penguins were probably swept along with the Humboldt current.

D. Charles Darwin:

Charles Darwin was an English naturalist who conducted important research on the islands. He became famous for his ideas on how animals make changes so they can survive. Darwin's boat was called The Beagle. When he reached the Galapagos, he stayed 90 days and noticed that the islands had plants and animals different from those on other islands. Much of his work was studying birds called finches He saw that, depending on the island, the beaks of these birds were different. Some beaks were for eating seeds, some for eating fruit and insects, and some finches used twigs to dig insects out of the bark of trees. Darwin said animals make slow changes in order to adapt to their environment. Those that cannot, do not survive.

E. Tortoises:

Tortoises are cold-blooded, egg-laying reptiles that lives on land and are found in the Galapagos Islands as well as an island near Madagascar. Their stumpy legs enable them to move on land. Smaller tortoises probably drifted from South America on pieces of land that broke off from the continent during floods. Males can weigh as much as 600 pounds. At one time there were 14 different kinds of tortoises, but now there are 10. Each island had a different species depending on climate and food. Pirates, sailors, and whalers ate tortoises and some became extinct.

F. Marine Iguanas:

The marine iguana's, which are endemic to Galapagos, ancestors were thought to live in Central or South America. They probably arrived on a piece of wood that was swept by the ocean currents. They had to adapt to the features of the islands. There was little fresh water or food; a major adaptation is eating red or green algae. They usually swim underwater for 10 minutes but can remain submerged for up to an hour. They look like diving dragons. They are cold-blooded, dark-skinned lizards whose dark coloring regulate
their body temperature by soaking up the sun rays. They also regulate their temperature by raising their bodies up on their front legs to allow cooling from the lava formations. During breeding season their colors change to red, green or orange to attract the opposite sex.

They have sharp curved claws to hang onto the underwater rocks to avoid being swept away by the currents. Land iguanas' claws are smaller. Their snout is shorter so they can find seaweed that grows on the rocks. Their tails are thin and can propel the animals through the water. The most amazing adaptation is how they drink water. Because of the scarcity of fresh water, they drink seawater. They must rid their bodies of excessive salt and do this by special glands connected to their nostrils. Iguanas push the salt water out their nose and it appears that they are sneezing. They allow finches and lava lizards to eat the ticks off their skin.

G. Galapagos Penguins:

A million years ago, penguins were flying birds. Many of them flew to Antarctica, which was a warm place then. There was plenty of food and they stopped flying to other places. In time, their wings became more like flippers.

The Galapagos penguins are the second smallest penguin and live the farthest north. They spend most of their time looking for food in the cool currents. They have adapted to two environments; hot land and cool water. Their bill is longer and thinner than bills of their relatives, the Magellanic penguins. When on land they can all be seen facing the same direction with their wings outward. They face the breeze and let the warm air escape from their bodies. Holding out their wings also helps protect their feet from getting sunburned. They also like to stay in caves on warm days. They make their nests on the lava rocks or in shaded caves and mate for life.

H. Flightless Cormorant:

This is another endemic species found on the island. Its wings are small and it is thought that this adaptation came about because swimming and became more important than flying. The cormorant is free of predators and had no need to fly, hence it became

flightless. It is a powerful swimmer with strong legs to propel itself in the water as it feeds underwater. Its body feathers are thicker, softer, hairlike, and more dense than its relatives.

I. Blue-footed Booby:

This bird is named because of the Spanish word *bobo* that means clown. The bird has a cross-eyed appearance with blue feet and beak. They build their nests right in the middle of the trail and are not bothered by visitors. Their amazing courtship dance consists of the make lifting up his blue foot in a goose-like walk. He puts a pebble over an imaginary nest and the female places a twig on top of it. They knock beaks together.

The boobies eat fish and dive head first into the water at a great speed. They have built-in air bags to cushion the dive.

J. Problems in Paradise:

As more and more people have moved to the islands, they have introduced plants and animals that are threatening native species. In the 1950s the population was 1,000 people and now it is approaching 20,000. Rats preying on bird and tortoise nests have affected the population. Dogs and pigs cause additional problems. Goats have destroyed the vegetation that tortoises eat, and they also eat the eggs and hatchlings. Feral cats have targeted the iguanas and some 700 introduced plants are interfering with the growth of native plants.

Fishing changes the organism's environment. Birds mistake fishing lines for food, and taking large amounts of fish from around the islands affects the ecosystem.

Tourists are also a problem and because of this, strict rules have been established. Groups must be accompanied by guides. No food or drink may be taken to the islands.They may contain insects that would continue to thrive in the area, or unwanted plants could occur if a visitor dropped a piece of fruit and its seeds grew. Visitors may not touch the animals for this could cause them to lose their tameness around humans. There is no feeding of the animals and littering is prohibited.

Minnesota Second Grade Science Standards as They Relate to my Unit of Study

Standard: The student will understand that science is a human endeavor practiced throughout the world.
Benchmarks under standard.
1. The student will give examples of scientific advances throughout history.

2. The student will recognize that repeating a scientific investigation will lead to very similar results.

Standard: The student will raise questions about the natural world, make careful observations and seek answers.
Benchmarks under standard.
1. The student will use appropriate tools to gather and organize data.

2. The student will recognize and describe patterns in data.

Standard: The students will understand that organisms live in different environments.
Benchmarks under standard.
1. The student will observe and describe some features of plants and animals that allow them to live in specific environments.

Standard: The student will understand that biological populations change over time.
Benchmark under standard.
1. The student will know that some kind of organisms that once lived on Earth are now extinct.

Unit Objectives and Focus

Provide specific facts about the Galapagos Islands, including formation and area
Discuss and define endemic animals of the Galapagos
Provide map study
Define vocabulary words
Explore reasons for adaptation of these species to their environment
Provide books on Galapagos Islands
Understand Charles Darwin's findings and theories
Cultivate responsible citizenship toward the environment
Understand problems and threats to animals from tourists
Apply these objectives to our local environment

Teaching Strategies

This unit will last approximately one week as part of my science curriculum. I will teach the following unit to my class, but I will also give mini-lessons to each grade level in the school. Part of this project will be a power point presentation of the pictures I took while on the islands.

Day 1

1. Brainstorming chart. Before studying the Galapagos Islands, find out what the students know about this area. I am aware that some students have seen Discovery and National Geographic programs. Accept all responses and record them on a chart. At the conclusion of the study bring out the chart to review each statement together. Statements can be revised or restated.
2. Using the map of the world, locate the islands and discuss that they are one of four regions of Ecuador. Discuss the distance from the mainland
3. Millions of years ago, these islands were not here. Hypothesize, in small groups, how islands appeared. Each class shares ideas with whole class. I will give correct information including how old the islands are.
4. Ask how plant species could have come to the islands. List ideas and supply more.

Vocabulary: mainland, volcano, hemisphere, archipelago, organism

Day 2 and 3

1. Introduce and define the word endemic. Show pictures of specific animals to be investigated.
2. Read books I have purchased to heighten interest in this topic.
3. Talk about mainland relatives of each animal as it is introduced. Ask the class their theory of how the animal arrived on the island. Begin with the obvious—birds.

Vocabulary: endemic, theory, algae

Day 4

1. Introduce Charles Darwin. Show pictures of Darwin and his boat. Give background of his journey and his landing on the Galapagos.
2. Tell findings of the finches Darwin saw. Ask class why this would have been amazing and puzzling. Proceed to what he saw in the other animals compared to their mainland relatives. Record these findings on chart paper.
3. Divide the class into cooperative groups. Each group will have an animal that has been investigated the last days. Each group will make a Venn diagram comparing this animal to its relative. Display and share these.

Vocabulary: Darwin, adaptation

Day 4

1. Talk about problems with domesticated animals, feral animals and the population increase of humans.
2. Discuss tourist regulations.
3. Have students imagine they are a TV news broadcaster. Write a news report telling the audience why conservation efforts are crucial to the islands.

Vocabulary: regulations, feral, endangered

Day 5

1. Discuss the Galapagos islands from the perspective of interest groups: fishermen, storeowner, tourist, scientist, nature club member.
2. Divide the class into teams of these interest groups. Each group reviews the feelings and perspective point of view of the person they are representing. Redivide the class so that each new group has a person from each interest group. A discussion, on a simple second grade level, shows the importance of solving the problems of the islands.
3. Show slide show.

Vocabulary: compromise

Day 6 and 7

1. Strive to connect the problems of the Galapagos Islands, the loss of habitat, possibility of endangered animals, threats of humans, etc. to that of our local wetlands, parks and wildlife areas. Encourage the class to see that responsible citizenship makes a significant difference everywhere on earth.
2. Make a mural, to hang in the hall, of Galapagos animals and their habitat. Label the animals.

Additional Activities

1. Students can write how they would save an endangered species. It does not have to be from the Galapagos Islands. For example, to save the elephant, insist on laws to prohibit elephant poaching, and encourage people not to buy ivory carvings.
2. Have students choose an animal. It does not have to be endangered. Have them write what they would miss if this animal became extinct. For example, “If dogs were extinct I would miss them jumping on me when I came home from school.”

Student Assessment

1. My assessment of students will be through class discussions, their ability to complete writing assignment, and cooperative group work. My activities involve science, social studies, and language. Assessments will overlap in these areas. I predict students will find this study fascinating and “awesome," and they, like me, will think of the Galapagos Islands as a magical place. We will all be enthusiastic learners!
2. It is important for the students to understand the connection between this unit and issues of our local environment. Although continents apart, we have some of the same concerns with conservation and protection of species.

Children's Books I will Use Throughout the Galapagos Unit

Amato, Carol. *Penguins of the Galapagos*. Hauppauge, NY: Barron's Educational Series, Inc., 1996.

Hachler, Bruno. *Blue Footed Booby Dance*. New York and London: A Michael Neugebauer Book, 2004.

Heller, Ruth. *Galapagos Means Tortoises*. San Francisco, CA: Sierra Club Books for Children, 2003.

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Davies, Derek and Hamilton, Dominic. *Traveler's Ecuador Companion*. Guilford, CT: The Globe Pequot Press, 2001.

Schiller, Nancy and Herreid, Clyde. *The Galapagos-Case Study Collection: National Center for Case Study Teaching in Science*.

Tagilaferro. *Galapagos Islands: Nature's Delicate Balance at Risk.* Minneapolis, MN: Lerner Publishing Co, 2001.

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