

LESSON PLAN: INTERDEPENDENCY ON CORAL REEFS

This lesson, for young children in preschool through grade 2, is designed to be used as part of a larger study of ecosystems. Using the patch coral reefs of the Bahamas as a specific example, the lesson explores the concept of *interdependency*, how plants and animals that live together in an ecosystem rely on one another and how a change in one organism affects other organisms.

The lesson is intended to be used in a whole group setting, with a class of 15 to 20 students, during one class period. In my classroom, it will be one small experience during a longer-term focus on the ocean and its inhabitants, a unit of study that includes reading books aloud, taking a field trip to the Minnesota Zoo's coral reef aquarium exhibit, sketching and painting activities and doing dramatic play about ocean life.

Lesson Title: "We're All In This Together"

Grade Level: Pre-K through 2nd grade

Content Area: Science

Time Allotment: one group-time period, about 20 minutes

Academic Standards Addressed: from Atlas of Science Literacy; Benchmarks on "living environment" for early childhood/primary grades:

- *Understand that some animals and plants are alike in the way they look and the things they do, and others are very different from one another.
- *Understand that plants and animals have features that help them live in different environments.
- *Understand that sometimes changing one thing causes changes in something else.

Abstract: After learning about the variety of organisms that live on a patch coral reef in the Bahamas, students will take on a "persona" of one of the organisms. Story scenarios read by the teacher will describe events that take place on the reef, and students will react to the changes that occur with each event.

Goal: Students will see and demonstrate how each organism affects other organisms on the reef, to get an understanding of the concept of interdependency in ecosystems.

Performance Indicators: Students will be able to describe how the organism they are portraying is affected when another organism "connected to them" experiences a change.

Background Information: Students need to be familiar with the names and types of organisms that live in a patch coral reef in the Bahamas, including hard corals, soft corals, reef fish (like the parrot fish and grouper), algae, urchins and lionfish. They also need to have a basic understanding of what corals are and what a reef is. Before this lesson, the teacher will have read aloud books and shown photos of the various reef organisms and had students draw from the photos.

Some good children's nonfiction books to use with young children:

Coral Reef: A City That Never Sleeps, by Mary M. Cerullo (Cobblehill Books, New York, 1996).

Where the Waves Break: Life at the Edge of the Sea, by Anita Malnig (Carolrhoda Books, Inc., Minneapolis, 1985).

Marine Biology, by Ellen Doris (The Children's School of Science, Woods Hole, MA, Thames and Hudson, NY, 1993).

It Could Still Be Coral, a "Rookie Read-About Science" book by Allan Fowler (Children's Press, New York, 1996).

Coral Reefs, by Sylvia A. Johnson (Lerner Publications, Minneapolis, 1984).

**Coral Reefs in Danger, by Christopher Lampton (The Millbrook Press, Connecticut, 1992). For older children – Good teacher background about coral bleaching and interdependency of organisms near coral reefs.

Corals: The Sea's Great Builders, by The Cousteau Society (Simon and Schuster, New York, 1992).

**Life in the Coral Reef, by Bobbie Kalman and Niki Walker (Crabtree Publishing Company, New York, 1997). Good overall information for children.

One Night in the Coral Sea, by Sneed B. Collard III (Charlesbridge, Massachusetts). Picture book story about coral spawning.

Coral Reefs, by Gail Gibbons (Holiday House, New York, 2007). Picture book format with paintings instead of photographs.

Materials: Books to build background knowledge. (See list above.)

Tags with pictures and names of each reef organism for children to wear around their necks:

hard corals

soft corals

algae

urchins

parrot fish

grouper

lion fish

Also make a tag saying "people" and one saying "sun."

A ball of yarn.

Instructional Procedure:

Introduction: Review with children what an *ecosystem* is (a community of plants and animals and the environment in which they live, which functions together). Help children name and describe some ecosystems they have learned about previously, such as a forest, a pond, a prairie, etc. Name some of the organisms that live in each ecosystem.

Review with children, using photographs, what a coral reef is (a structure or colony in warm ocean waters built of coral skeletons that supports coral polyps and provides habitat for many other plants and animals, like an underwater city) and how it is formed.

Review creatures the class has seen before (in books, photos, travels) that live on or near coral reefs. Specifically, introduce hard corals, soft corals, parrot fish, grouper, lion fish, spiny urchins and algae. Use photographs on cards to show the organisms.

Activities: Ask for volunteers to act out the parts of ocean organisms. One child can play an organism, or a number of children can all be hard coral, grouper fish, etc. so that everyone is involved. Distribute picture tags to the volunteers to wear around their necks. Ask children to invent a gesture or small movement to represent their organism. (Corals can make little polyps with their hands, lionfish might make “spikes” on their backs, etc.) As you narrate the various scenarios below, each organism that is mentioned can take a hold of the piece of yarn, unrolling the yarn ball as it is passed from one organism to the next. They keep hold of it as the narration unfolds, creating a web of yarn linking each organism. As organisms are mentioned, children gently tug on the yarn that connects them to other organisms, to demonstrate that what affects one thing also has an effect on other things in the ecosystem. If they want to, children can also use gestures and pantomime to act out what is happening (eating something, feeling sick, getting caught in a fishing net, etc.) each time their end of the yarn gets a tug.

Tell a story about the organisms, including the following ideas:

On the rocks near shore, hard corals have begun to form. There are brain corals, fire corals, mustard hill corals, mountainous star corals, and lots more kinds. Their tiny polyps open to catch food that drifts by in the water but they can't move off the reef. Their skeletons build the reef like adding bricks to a wall. (*Give the hard corals the yarn ball and have them hold the end.*)

Near by are soft corals swaying in the current. They stay attached to rocks but they don't build the reef. They also have tiny polyps for eating food drifting by, and they make nice hiding places for small fish. (*The hard corals toss the ball to the soft corals, spooling out a length of yarn and hanging on to the end. Toss the yarn ball to the fish that hide among them, and they toss it back.*)

Growing on the rock and on the coral are plants called algae. They can be soft and green like moss or crunchy like little tiny branches or flat and crusty. They need sunlight to grow. They can cover up a little bit of the coral or a lot of the coral, depending on the water temperature and how much of them gets eaten by fish or urchins. (*Soft corals toss the ball the algae, who toss it back to the hard corals, so they are all webbed together.*)

The long-spined urchins find places to sit in the coral reef. The spines are sharp and can protect the urchin from predators that might want to eat it. It eats algae off the reef. (*Hard corals toss the ball to the urchins, who hold the yarn and toss the ball back to the algae.*)

Swimming along near the hard and soft corals are different kinds of fish. There are parrot fish and grouper fish that nibble on the corals and the algae that grow there. (*Algae toss the yarn ball to each of the fish and they each hold on and toss the ball back to the algae.*)

There is also one lion fish that came all the way from a far-away ocean. It didn't always live in the Bahamas, but has come here recently. Its spiky fins are very poisonous to people and to other

fish. It holds very still so it looks like seaweed and waves its spiky fins to try to sting passing fish to kill them. *(Fish toss the yarn ball to the lion fish.)*

The sun shines on the ocean, giving light to make the algae grow and the coral polyps grow. *(Toss yarn ball between sun and algae and sun and corals.)*

Questions:

What happens as the fish eat the algae?

(Have fish gently tug on their pieces of yarn so the algae can feel the tug. When the relationship is in balance, the algae grow food for the fish and the fish eat enough algae to keep the coral healthy.)

What happens if the lion fish kills some of the algae-eating fish?

(Lion fish gently tug the yarn so fish can feel it.)

What happens to the algae if fewer fish are nibbling on it?

(Algae gently tug the yarn connecting them to the corals. Too much algae growing on coral can cut off sunlight to the coral and make it sick or even kill it.)

How does the sun affect other things on the reef?

(Have sun tug on everything connected to it. If things are in balance, the sun helps algae and other plants and coral grow and gives light to the fish.)

What happens if the water gets polluted and dirty?

(Less sun can reach the reef. Less food drifts by the coral so they have less to eat. Have sun tug on yarn so corals and algae can feel it. They would not thrive and there is less food for the fish.)

What happens if the sun makes the water too warm?

(This is like global warming. Scientists theorize that higher water temperatures make the corals ill, which makes them bleach. The algae would also grow faster, threatening the corals. Have the sun tug gently on the yarn to the algae and the corals.)

If there is too much stress on the corals, pieces of coral die and break off. How does that affect the other organisms?

(Have corals tug on all their yarn pieces. Urchins have fewer places to live. Fewer algae can grow, making less food for fish and for urchins. New coral has less space to grow; there's less of a foundation reef. The reef begins to get smaller.)

Add people to the equation. How do they affect the reef and the organisms?

(Toss yarn to people. They might fish for some of the reef fish so there are fewer fish to eat the algae and fewer fish for lion fish to eat. They might dive or snorkel and accidentally break off pieces of the reef. They can also dive or snorkel carefully and study the reef, or even repair broken parts of it.)

In what other ways can one thing affect something else in this web? *(Take children's suggestions.)*

Closure: Review what an ecosystem is and how each organism is connected to other organisms. Introduce the term *interdependent*. Make the picture tags available to children to continue using during free choice or play time. Encourage them to act out the parts in dramatic play. Provide a coral reef background transparency projected on a shadow screen behind their play area, if you have one.

Assessment:

Record children's comments as you do the webbing activity, either with a tape recorder or by having an assistant take notes as the children talk. Also note their dramatic play after the lesson, recording spontaneous observations and comments they make.

Connection to Other Content Areas:

This lesson can be part of a larger study of the ocean or of ocean animals. The use of literature including picture books and children's nonfiction adds a literacy element. The arts can be included as children do further dramatization of the relationships between organisms, and through visual art extensions.

Extensions:

Offer small groups of children a large piece of paper (from a roll) and oil crayons to draw a mural of a coral reef. Different children can draw different organisms as they collaborate to fill the paper. Have them use watercolors to wash over the oil crayon drawings to fill the background with "water." Talk about what colors would be accurate to use to make it resemble the ocean. Hang the murals on the classroom walls when they are dry. (These could also be good backdrops for the dramatic play area.)

Acknowledgements:

The webbing activity is adapted from a similar game developed by Project Wild. See "Background Information" above for a bibliography of children's books used.
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