

Hawaii's Coral Reef Ecosystem Curriculum



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Grade Level: Fourth Grade

Purpose: This curriculum is designed to communicate:

- I. Corals as Organisms
- II. How the coral reefs of Hawaii are physically and biologically structured.
- III. Fish Adaptation
- IV. What the major natural and human induced impacts to the coral reef habitat are and how our actions directly tie into the survival of Hawaii's coral reefs

Hawaii Content and Performance Standards (HCPSIII) Addressed:

Standard 1: The Scientific Process: Scientific Investigation: Discover, invent, and investigate using the skills necessary to engage in the scientific process.

Benchmarks

SC.4.1.1 Describe a testable hypothesis and an experimental procedure

SC.4.1.2 Differentiate between an observation and an inference

Standard 2: The Scientific Process: Nature of Science: Understand that science, technology, and society are interrelated.

Benchmarks

SC.4.2.1 Describe how the use of technology has influenced the economy, demography, and the environment of Hawaii.

Standard 3: Life and Environmental Sciences: Organisms and the Environment: Understand the unity, diversity, and interrelationships of organisms, including their relationship to cycles of matter and energy in the environment.

Benchmark

SC.4.3.1 Explain how simple food chains and food webs can be traced back to plants.

SC.4.3.2 Describe how an organisms behavior is affected by its environment (e.g. courting, nesting, feeding patterns)

Standard 5: Life and Environmental Sciences: Diversity, Genetics, and Evolution: Understand genetics and biological evolution and their impact on the unity and diversity of organisms.

Benchmark

SC.4.5.2 Describe the roles of various organisms in the same environment

SC.4.5.3 Describe how different organisms need specific environmental conditions to survive

Standard 6: Physical, Earth, and Space Sciences: Nature of Matter and Energy: Understand the nature of matter and energy, forms of energy (including waves), and energy transformations, and their significance in understanding the structure of the universe.

Benchmark

SC.4.6.1. Describe how some materials may be combined to form new substances.

Rationale:

Coral reefs in the Hawaiian archipelago comprise over 80% of U.S. coral reefs and span over 2,000km. Hawaiian reefs possess some of the most abundant levels of marine endemic species in the world as well as sheltering over 700 species of fish, 400 species of algae and over 2000 species of invertebrates. Our coral reefs are not only important to protecting our shoreline from storms and wave damage but also provide economic benefits to our local communities through marine tourism and nearshore fisheries. Reef-building corals are the keystone framework organisms in coral reefs and a decline in coral health will have direct and immediate effect to the entire coral reef ecosystem thereby threatening endemic species. For this reason it is important for our youth to understand that corals are not colorful rocks but living organisms which in itself is an ecosystem. This curriculum uses hands-on activities to promote interactive learning about Hawaii's coral as organisms and the coral reef ecosystem.

Concept Map for Unit: See attached sheet

Formative Assessment:

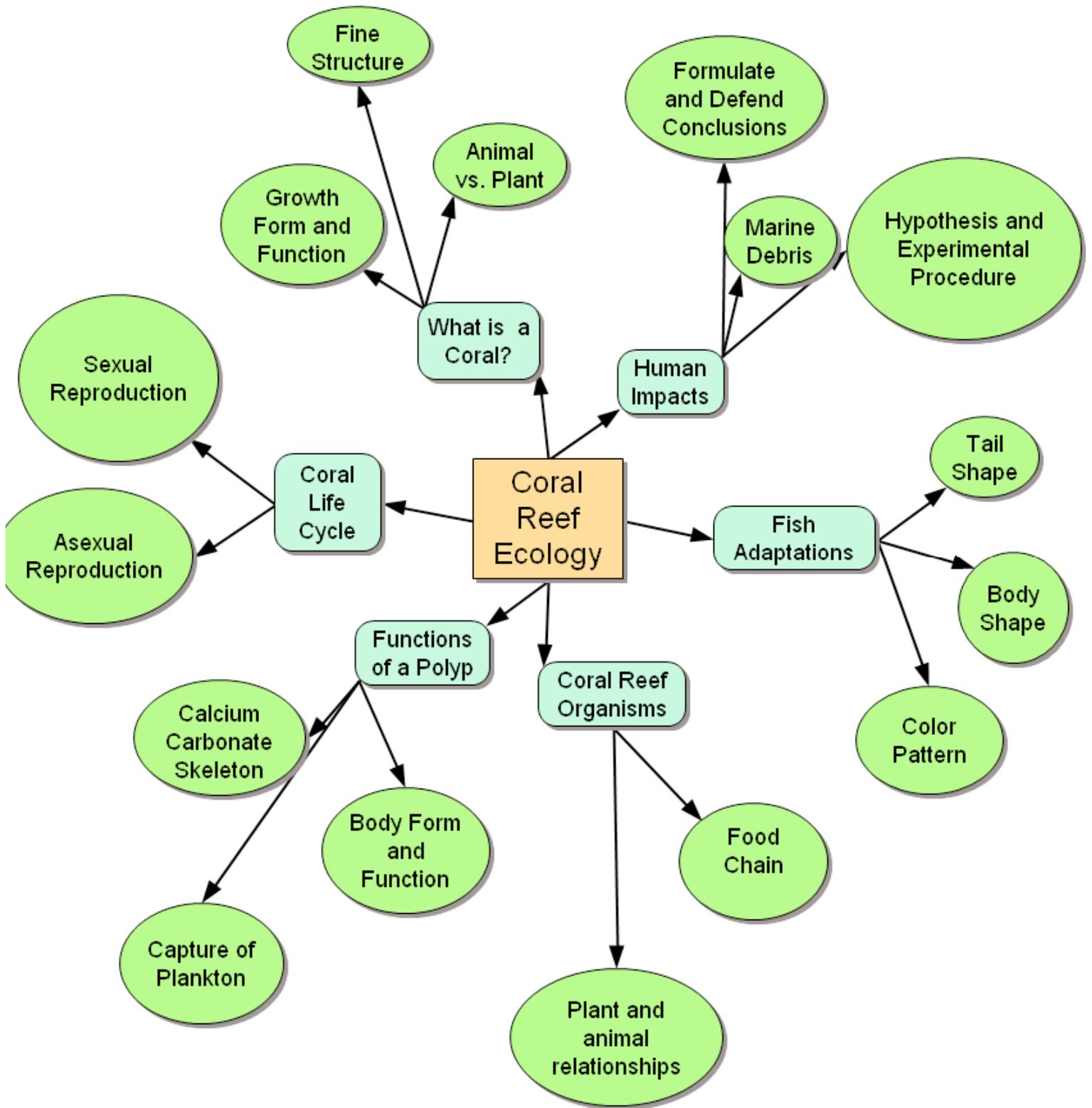
Students will demonstrate continued learning throughout the unit through successful completion of activity specific worksheets, incorporation of theatrical arts into their daily science lessons by acting out coral organism biology. Student learning will also be demonstrated through storyboard writing, production of dioramas, artistic performance and achievement on written tests. Checklists are given at the end of each lesson which can then be compared to a rubric for a cumulative grade for each lesson.

Summative Assessment:

Students will demonstrate the information that was retained about corals and the coral reef ecosystem by describing in detail on a blank piece of paper, using pictures and words, topics that were studied on a blank sheet of paper. Through this method the bulk content knowledge can be assessed.

Overview of Lessons Chart: See attached sheet

Coral Reef Ecology Concept Map



Coral Reef Ecology Overview of Lessons Chart

Lesson Name	Key Concepts	Student Objectives	Activity Description	Assessment
What Is Coral?	Coral growth form and function; fine structure; animal vs. plant	<p>Lesson 1.1</p> <ol style="list-style-type: none"> 1) Each student will make a statement and ask a question about coral 2) Students will be able to identify coral facts from fictional statements 3) Students will learn vocabulary pertaining to coral 4) Students will learn corals are animals and not plant <p>Lesson 1.2</p> <ol style="list-style-type: none"> 1) Students will learn to make observations and express what they see through creative writing. 2) Students will be able to use adjectives to describe and communicate their coral pictures. 3) Students will use the process skills of observing, comparing and describing when looking at a picture of a coral <p>Lesson 1.3</p> <ol style="list-style-type: none"> 1) Students will be able to classify corals into different growth forms. <p>Lesson 1.4</p> <ol style="list-style-type: none"> 1) Students will be able to use scientific terminology to describe coral pictures <p>Lesson 1.5</p> <ol style="list-style-type: none"> 1) Students will be able to draw the fine detail of coral skeletons. 2) Students will be able to make observations and inferences about their coral skeleton. 	Students will be able to work cooperatively and with the teacher to ask questions about coral. Students will observe and compare coral skeletons and make inferences about the coral's characteristics. Then using pictures of corals, students will classify the different coral growth forms.	<ol style="list-style-type: none"> 1. Complete Worksheets 2. Created a diorama displaying at least 3 out of 5 growth forms.
Life cycle of a coral	Modes of sexual and asexual reproduction	<p>Lesson 2.1</p> <ol style="list-style-type: none"> 1) Each student will make a statement and ask a question about a coral's life cycle 2) Students will be able to identify coral life cycle facts from fictional statements. 3) Students will learn vocabulary pertaining to a coral's life cycle. 	Students will be able to work cooperatively and with the teacher to ask questions about the life cycle of a coral. Students will assemble in order life cycle stages of a sexually reproducing coral using pictures and words.	<ol style="list-style-type: none"> 1. Coral dramas 2. Can describe the lifecycle stages 3. Can state corals reproduce using asexual and sexual reproduction.

		<p>4) Students will be able to use drama to show the different types of sexual and asexual reproduction.</p> <p>Lesson 2.2</p> <p>1) Students will be able to state that coral reproduce using sexual and asexual reproduction and be able to describe each mode in detail.</p> <p>2) Students will be able arrange the life cycle stages of a sexually reproducing coral.</p>		4. Life cycle test
Functions of a Polyp	Body form and function; calcium carbonate skeletons; Plankton capture	<p>Lesson 3.1</p> <p>1) Students will learn vocabulary pertaining to coral polyp anatomy</p> <p>2) Students will learn how polyps feed</p> <p>3) Students will be able to perform dramas of a coral polyp functions</p> <p>Lesson 3.2</p> <p>1) Students will review the parts of a coral polyp by building an edible coral polyp model</p> <p>Lesson 3.3</p> <p>1) Students will be able to observe and then describe the growth of crystals that develop in similar way to how coral polyps create their calcium cups</p> <p>Lesson 3.4</p> <p>1) Students will be able to demonstrate that individual polyps, though connected, feed independently in a coral colony.</p>	Students will be able to work cooperatively and with the teacher to ask questions about the function of a coral polyp. Students will learn about the anatomy of a coral polyp through reading and vocabulary and then apply what they learned to build an edible model of a polyp. In this lesson, students will also simulate coral growth by growing crystals and play an interactive game to demonstrate how corals feed.	<p>1. Coral dramas</p> <p>2. Anatomy test</p> <p>3. Comic strip on the coral wars that occur on a reef including life and death</p>
Coral Reef Organi:	Food Chain; Plant and animal relationships	<p>Lesson 4.1</p> <p>1) Each student will make a statement and ask a question about coral reef organisms</p> <p>2) Students will be able to identify facts from fictional statements about the organisms that live in a coral reef.</p> <p>3) Students will learn vocabulary pertaining to coral reefs.</p> <p>Lesson 4.2</p> <p>1) Students will be able to replicate a 3D coral reef using different growth forms and zones.</p>	Students will be able to work cooperatively and with the teacher to ask questions about coral reef organisms. Students will then create and assemble a coral reef mural for coral reef organisms to live in. Next, students will explore how different reef organisms are dependent on one another	<p>1. Coral reef mural organism</p> <p>2. Food Chain test</p>

		<p>Lesson 4.3</p> <p>1) Students will be able to demonstrate the relationships between plants and animals in a coral reef food chain.</p>	for survival through research and an interactive game.	
Fish Adaptations	adaptations as tail shape; body shape; color patterns needed for different environments.	<p>Lesson 5.1</p> <p>1) Students will be able to state prior knowledge of fish</p> <p>Lesson 5.2</p> <p>1) Students will be able to find examples of fish survival strategies in a video</p> <p>Lesson 5.3</p> <p>1) Students will be able to identify the body parts of a fish</p> <p>2) Students will know different kinds of fishes have many similarities since all are adapted to be survivors in a water habitat.</p> <p>Lesson 5.4</p> <p>1) Students will learn new vocabulary about fish adaptations through visual images.</p> <p>Lesson 5.5</p> <p>1) Students will be able to investigate and observe the adaptations of fresh fish.</p> <p>2) Students will be able to make predictions about where fish live and what type of food it eats.</p> <p>Lesson 5.6</p> <p>1) Students will be able to create a 3-D fish with adaptations necessary for a certain habitat and be able to defend the adaptations they chose.</p>	Students will learn what adaptations fish have in order to survive to life in water. Activities include a thought swap on what a fish needs to survive, dressing up as a fish, observing and comparing fresh fish and creating their own fish.	<p>1. Complete Worksheets</p> <p>2. 3-D Fish with adaptations</p> <p>3. Fish Anatomy test</p>
Human Impacts to Coral Reefs	Hypothesis development experimental procedure; marine debris; formulate defend conclusions	<p>Lesson 6.1</p> <p>1) Students will be knowledgeable about natural and human threats to coral reefs</p> <p>2) Students will be knowledgeable about marine debris in Hawaii.</p> <p>3) Students will be able to describe their reactions to why and how marine debris occurs and how we can decrease the amount of marine debris.</p>	Human and natural threats to coral reefs will be introduced to the students and a focus will be made on how marine debris affects coral reefs and its organisms. Students will devise a testable hypothesis	<p>1. Complete worksheets</p> <p>2. poster to communicate the negative impact of marine debris to the community</p>

		<p>Lesson 6.2</p> <ol style="list-style-type: none"> 1) Students will be able to categorize different types of debris 2) Students will be able to determine how a material can influence what becomes marine debris. <p>Lesson 6.3</p> <ol style="list-style-type: none"> 1) Students will be able to devise a testable hypothesis and an experimental procedure <p>Lesson 6.4</p> <ol style="list-style-type: none"> 1) Students will learn how to count and record the number of objects they see using a transect line. <p>Lesson 6.5</p> <ol style="list-style-type: none"> 1) Students will be able to collect and categorize the data they collected using the experimental procedure they created <p>Lesson 6.6</p> <ol style="list-style-type: none"> 1) Students will be able to formulate and defend conclusions based on the evidence they gathered. 	<p>about marine debris at a local beach and then create an experimental procedure to test their hypothesis. The students will graph their data, accept or reject their hypothesis, and then as a class compare their data to past studies of marine debris collection at the same beach. Students will also be able to describe how the use of technology has influenced the economy, demography, and environment of Hawaii.</p>	
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