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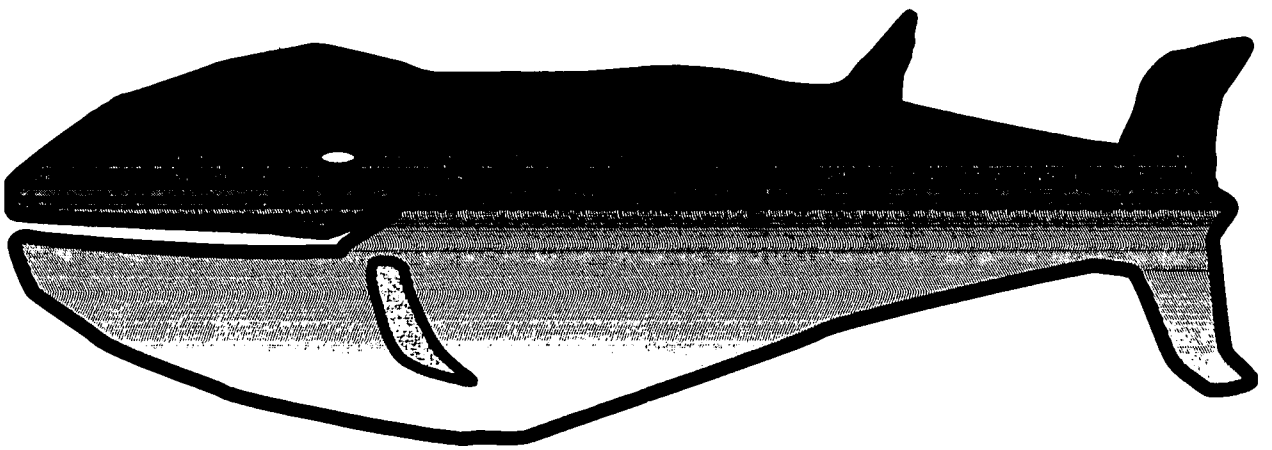
ABSTRACT

Ocean Environments for Grade 5 is a 12-week interdisciplinary ocean environmental unit designed for teachers to use with their students. The unit emphasizes investigation and understanding of our ocean environments, including their geological, physical, and biological characteristics. It also stresses awareness of public policy decisions related to the assessment of marine organism populations and pollution prevention. The 30 lessons contained within cover a number of topics including matter, sound transmission, biological characteristics of earth, geological characteristics of earth, cells, insulation, and ocean environments. The lessons are interdisciplinary in their approach, meeting objectives from science, mathematics, oral language, reading, literature, writing, research skills, and technology. (DDR)

Connections:
Ocean Environments Unit
Grade 5



"Meeting the SOLS Using Natural Resources"
Inspired by a Course at VA Tech College of Forestry and Wildlife,
Summer 1996 (Kathy Sevebeck, Instructor)

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Ocean Environments: Grade 5

Unit Description

This is a 12-week interdisciplinary ocean environments unit for teachers of grade 5 to use with their students. It emphasizes investigation and understanding of our ocean environments-- including their geological, physical, and biological characteristics. It also stresses awareness of public policy decisions related to the assessment of marine organism populations and pollution prevention.

SOL

Science

5.1 Plan and conduct investigations
5.2 Study sound transmissions
5.3 Study characteristics of white light
5.4 Study of matter (liquid, solid, or gas)
5.5 Study cells and other characteristics of organisms
5.6 Study ocean environment
5.7 Study earth's surface

Math

5.3 Solve problems involving computation and estimation
5.11 Appropriate measuring devices
5.12 Amount of elapse time
5.15 Identify the ordered pair of coordinates
5.16 Solve problems involving probability
5.17 Collect, organize, and display data
5.19 Investigate numerical and geometric patterns

Computer/Technology

5.2 Develop basic technology skills
5.3 Process, store, retrieve, and transmit electronic information
5.4 Communicate through application software

English:

Oral Language
5.1 Discussions
5.2 Nonverbal communication skills
5.3 Planned oral presentations
Reading/Literature
5.4 Reference materials
5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing
5.7 Write for a variety of purposes
Research
5.8 Synthesize information from a variety of sources

RESOURCES

Teacher Sources:

Teaching Science to Children, Alfred Friedl

Naturescope: Diving Into Oceans, National Wildlife Federation
National Wildlife Federation
1400 Sixteenth Street, N.W.
Washington, DC. 20036-2266

Water Precious Water (2-6): Aims
AIMS Education Foundation
P.O. Box 8120
Fresno, CA 93747-8120

UNITES: Using Literature to Unite the Curriculum V2 (Grades 3-5)
BEM Publishing, Inc.
707 Crestwood Drive
Blacksburg, VA 24060-6005

Project WILD (P/W)
Suzie Gilley
Department of Game and Inland Fisheries
P.O. Box 11104
Richmond, VA 23230

Project Aquatic WILD (A/W)
Suzie Gilley
Department of Game and Inland Fisheries
P.O. Box 11104
Richmond, VA 23230

Project WET
Ann Regn
Department of Environmental Quality
629 E. Main Street
Richmond, VA 23240

Videos/CD ROMs

The 3-D Sea, 3-2-1 Contact
Earth is Change, 3-2-1 Contact
P.O Box 80669
Lincoln, NE 68501

Oceans, Reading Rainbow
Humphrey the Humpback Whale, Reading Rainbow
P.O Box 80669
Lincoln, NE 68501

Magic Schoolbus on the Ocean Floor, Scholastic
2931 E. McCarty St.
Jefferson City, MO 65101

Students read:

Call It Courage, Armstrong Sperry (25 copies)
Time of Wonder, Robert McCloskey (30 copies)
Island of the Blue Dolphins, Scott O'Dell (25 copies)
Julie of the Wolves, Jean Craighead George (25 copies)

Student Sources:

Finding the Titanic, Robert D. Ballard
Who Sank the Boat, Pamela Allen
The Visual Dictionary of Ships and Sailing, Dorling Kindersley
Usborne Understanding Geography: Seas and Oceans
What is a Wave? Chris Arvetis
Seashore Animals, Michael Chinery
House for Hermit Crab, Eric Carle (Big Book)
Twenty Thousand Leagues Under the Sea , Jules Verne
The Desert Beneath the Sea, Ann McGovern
Magic School Bus on the Ocean Floor, Joanna Cole
The Seashore, Gillimard Jeunesse and Elisabeth Cohat
Seabird, Clancy Holling
The Underwater Alphabet Book, Jerry Pallotta
Greg's Microscope, Barbara Gregorich
Why the Whales Came, Michael Morpurgo
Sea Full of Whales, Richard Armour
Big Book Magazine: Whales (Scholastic)
The Whale's Song, Dyan Sheldon
The Sea Otter, Maggie Blake
Dancing with Manatees, Faith McNulty
Whales, the Gentle Giants, Joyce Milton
Sea Turtles, Caroline Arnold
Prince William, Gloria Rand
Ibis, A True Whale Story, John Himmelman
Come Back Salmon, Molly Cone
Swimmer, Shelley Gill
A Tale of Antarctica, Ulco Glimmerveen

List of Activities in the Unit

"Finding the Titanic"*Robert D. Ballard*
"Who Sank the Boat"*Pamela Allen*
"The Visual Dictionary of Ships and Sailing" *Dorling Kindersley*
"Mr. Archimedes' Bath" *UNITES V2 (5) p.* 92
"How Wet is Our Planet?" *Project* A/W p. 8
"Salinity of Ocean Environment" *Nature Scope: Diving Into Oceans* p.3
"The Water Molecule" *Aims: Water pp.3-6*

"Molecules in Motion"*Project WET p. 47*
"What is a Wave"Chris Arvetis
"Coasts & Shoreline Communities" *Naturescope: Diving Into Oceans pp. 36-51*
"Old Water" *Project WET p.* 171
"Twenty Thousand Leagues Under the Sea" *Jules Verne*
"Great Water Journeys" *Project WET* p. 246
"The Illustrated World of Oceans" *Susan Wells*
"Are You Me?" *Project A/W* p.14
"Marsh Munchers" *Project A/W* p. 58
"Macro invertebrate Mayhem" Project *WET* p. 322
"Micro Odyssey" *Project A/W* P. 64
"The Underwater Alphabet Book" *Jerry Pallotta*
"Whale Research" *Whales: Evan-Moore*
"Whale of a Tale" *Project A/W p. 26*
"The Whale's Song" *Dyan Sheldon*
"Whale and Other Mammals' Insulation"
"Cold Cash in the Icebox" *WET* p. 373
"Turtle Hurdles" *Project A/W* p. 164
"Hooks and Ladders" *Project A/W* p. 69
"Prince William"*UNITES V2 (4) p. 80*
"Fashion a Fish" *Project A/W p. 88*
"Net Gain, Net Loss" *Project A/W p.104*
"No Water Off a Duck's Back" *Project WILD* p. 274

Suggested List of Additional Activities (not in Unit)

"Island of the Blue Dolphins" *Scott O'Dell*
"Julie of the Wolves" *UNITES V2* (5) p.104
"Mrs. Frisby and the Rats of NIMH" *UNITES V2* (5) p. 112
"My Side of the Mountain" *UNITES V2* (5) p.114
"Call of the Wolves" *UNITES V2* (5) p. 124.
"How to Eat Fried Worms" *UNITES V2* (5) p.126
"Why the Whales Came" *UNITES V2* (5) p. 130
"The Wartville Wizard" *UNITES V2* (5) p.128
"The Rainstick" *Project WET p. 442*
"Name That Tree" *PLT p. 68*
"Salt Marsh Player" *Project WET p. 99*
"In the Good Old Days" *PLT p. 349*
"Great Stony Book" *Project WET* p. 150
"Water Messages in Stone" *Project WET p. 454*

Lesson 1: Matter (Water as Matter)

Objective: Students will investigate and understand that matter has mass, takes up space, and occurs as a solid, liquid or gas

Materials: sink/float sheets, objects (some float, some don't), 6 flex-tanks, 6 balance scales

Procedures:

1. Ask: "Water is matter?"
   (takes up space as a solid (ice), liquid (water), gas (steam)
2. Read *Finding the Titanic*
   a. Predict what happened to the Titanic and make conclusions about it.
   b. Write a written explanation of what happened to the Titanic
   c. Share your explanation with the class
3. Experiment with "Sink/Float"
   (sink/float sheets, objects, 6 flex-tanks)
   a. Weigh objects to be tested (balance scales)
   b. Fill out sink/float sheets
   c. Record data using a computer graphics program
   c. Share results

Evaluation: Assess student use of balance scales

SOL:
- Science: 5.1 Plan and conduct investigations; 5.4 Study matter (has mass; takes up space, & occurs in states)
- Math: 5.11 Appropriate measuring devices; 5.17 Collect, organize, and display data
- Computer/Technology: 5.2 Develop basic technology skills; 5.4 Communicate through application software
- English: Oral Language: 5.1 Discussions; 5.3 Planned oral presentations
- Reading/Literature: 5.6 Comprehension of a variety of literary forms
- Writing: 5.7 Write for a variety of purposes

Lesson 2: Matter

Objective: Students will investigate and understand how the shape of a mass affects its buoyancy

Materials: 25 sticks of clay, 6 flex tanks

Procedures:

1. Experiment with the variable "shape" of objects in water
   (control for mass, and size)
2. Read *Who Sank the Boat,* Pamela Allen
   a. Answer the question, "Do you know who sank the boat?" in paragraph form
   b. Share your conclusions with the class
   c. Discuss the scientific explanation of how the boat sank (collective mass of boat riders)
   d. Examine the simple question and answer literary form the author uses to convey her message
   e. Try writing an investigation on another topic (why a plane crashed, how a car got stuck, how your bike broke) using this literary form
3. Design a clay boat that floats

Evaluation: Assess student abilities to construct a clay boat that floats

SOL:
- Science: 5.1 Plan and conduct investigations; 5.4 Study matter (has mass; takes up space, & occurs in

states)
Math: 5.11 Appropriate measuring devices
5.17 Collect, organize, and display data
English: Oral Language: 5.1 Discussions
5.3 Planned oral presentations
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

Lesson 3: Matter

Objective: Students will investigate to determine carrying capacity of clay boats

Materials: Counters (e.g. Teddy bears, paper clips, pennies), flex tanks, graph paper

Procedures:

1. Read *The Visual Dictionary of Ships and Sailing,* Dorling Kindersley
   a. Compare fictional sailing books with this non-fictional account of sailing
   b. Discuss the different types of ships in the book
   c. Use reference materials (CD-ROM, Internet, or other library media) to describe one type of ship (Viking, Greek, Roman, fighting, wooden, iron) in a 1-2 page report
   d. Present your report to the class
2. Estimate and count the number of passengers
3. Graph the results using a computer graphics program
4. Interpret data
   a. Make comparisons using data
   b. Draw conclusions

Evaluation:

1. Assess student abilities to use a word-processing program write a 1-2 page report
2. Check student computer graphs for accuracy

SOL: Science: 5.1 Plan and conduct investigations
5.4 Study matter (has mass; takes up space, & occurs in states)
Math: 5.3 Solve problems involving computation
5.11 Appropriate measuring devices
5.17 Collect, organize, and display data
Computer/Technology: 5.2 Develop basic technology skills
5.3 Process, store, retrieve, and transmit electronic information
5.4 Communicate through application software
English/Oral Language: 5.1 Discussions
5.3 Planned oral presentations
Reading/Literature: 5.4 Reference materials
5.5 Literary forms
5.6 Comprehension of a variety of literary forms

Writing: 5.7 Write for a variety of purposes
Research: 5.8 Synthesize information from a variety of sources

Lesson 4: Matter

Objective: Students will investigate the density of matter in water (1.0)

Materials: Copy density table *UNITES V2 (5)* p. 95, 20 oz. bottles filled with sand, water, air (one each), flex-tanks, tape, balance scales, calculators, masking tape, milliliter containers)

1. Read *Mr. Archimedes' Bath,* Pamela Allen
   a. Examine the unique literary style the author uses to convey a scientific principle
   b. Try writing a story explaining how a clay boat floats using this literary style
   c. Discuss Archimedes' discovery
   d. Write an explanation of Archimedes' principle
   e. Pretend you and your friends are at the town swimming
   f. Use Archimedes' principle to tell what happens to the water in the pool when you and your friends get in and out of it
2. Perform "Mr. Archimedes' Bath" activity from *UNITES V2 (5)* p. 92
   a. Control dependent variables (size and shape)
   b. Experiment with independent variable (mass)
   c. Test three bottles (sand, water, air)
4. Determine the density of each (d=m/v)
5. (Optional) Record the data using a computer graphics program

Evaluation: Assess student abilities to determine the density of matter tested

SOL:
Science: 5.1 Plan and conduct investigations
5.4 Study matter (has mass; takes up space, & occurs in states)
Math: 5.3 Solve problems involving computation
5.11 Appropriate measuring devices
5.17 Collect, organize, and display data
Computer/Technology: 5.2 Develop basic technology skills
5.4 Communicate through application software
English/Oral Language: 5.1 Discussions
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

Lesson 5: Matter

"How Wet is Our Planet?" *Project* A/W p. 8

Objective: Students will determine the amount of potable water on the Earth's surface

Materials: 5,000 mL (1-1/2 gallon) containers, table, calculators, mL containers, salt

Procedures:

1. Measure amount of drinkable (potable) water from 5,000 mL flex tank (Earth's surface= 97.2% oceans (4% saline), 2.0% glaciers/icecaps, .8%

freshwater)

2. Read *Teaching Science to Children,* Alfred Friedl p. 205 "Why Turn to the Oceans"
   a. Research the planet Earth using NASA's Spacelink address "http://spacelink.msfc.nasa.gov/"
   b. Write about what you see as you approach the planet Earth in your spaceship in a 1-2 page report using a word processor
   c. Share your "Spaceship to Planet Earth" adventure
3. Use remaining salt water to perform experiments
   a. Salt water gardening (water bean plants with and without salt water)
   b. Desalinization of salt water (freeze it)

Evaluation: Assess student abilities to explain the affect of temperature on water (i.e., water is the only liquid that becomes less dense as it becomes a solid)

SOL:

Science:	5.1 Plan and conduct investigations
	5.4 Study matter (has mass; takes up space, & occurs in states)
	5.6 Ocean environments (salinity)
Math:	5.3 Solve problems involving computation
	5.11 Appropriate measuring devices
	5.12 Amount of elapse time
	5.17 Collect, organize, and display data
Computer/Technology:	5.2 Develop basic technology skills
	5.3 Process, store, retrieve, and transmit electronic information
	5.4 Communicate through application software
English/Oral Language:	5.1 Discussions
	5.3 Planned oral presentations
Reading/Literature:	5.4 Reference materials
Writing:	5.7 Write for a variety of purposes
Research:	5.8 Synthesize information from a variety of sources

Lesson 6: Salinity of Ocean Environment

Objective: Students will investigate and understand characteristics of oceans

Materials: 6 flex tanks, 6 pints salt, dozen eggs, aluminum foil, balance scales

Procedures:

1. Experiment with oceans, *Nature Scope: Diving Into Oceans* p.3
   a. Measure water (6-11/2 gallon tanks=2/3 C fresh water)
   b. Float an egg in water (6 pints salt, dozen eggs)
2. Do "Time of Wonder" activity *UNITES V2 (4)* p.92
   a. Compile a list of the author's figurative language and illustrate it
   b. Write "My Time of Wonder" using imagery similar to the author's
   c. Float 15" square aluminum sailboats in water
3. View video "Time of Wonder"

Evaluation: Assess student abilities to accurately demonstrate one characteristic of

oceans (e.g., buoyancy)

SOL: Science: 5.1 Plan and conduct investigations
5.4 Study matter (has mass; takes up space, & occurs in states)
5.6 Ocean environments (salinity)
Math: 5.3 Solve problems involving computation
5.11 Appropriate measuring devices
5.12 Amount of elapse time
5.17 Collect, organize, and display data
English/Oral Language: 5.1 Discussions
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

Lesson 7: Matter

"The Water Molecule" ***(Aims: Water pp.3-6)***

Objective: Students will investigate and understand key concepts: atoms, molecules, elements, and compounds

Materials: Copy *Aims: Water* pp. 3-6, tagboard, scissors, markers

Procedures:

1. Introduce "Were You Aware?" (3 types of water) sheet
2. Make water molecule (H_2O, protons, electrons, neutrons)

Evaluation: Assess student abilities to demonstrate their understanding of the water molecule by making a model

SOL: Science: 5.1 Plan and conduct investigations
5.4 Study matter (molecules, atoms)
Math: 5.3 Solve problems involving computation
5.17 Collect, organize, and display data

Lesson 8: Matter

"Molecules in Motion" *Project WET p. 47*

Objective: Students will investigate and understand the effect of temperature on states of matter of water molecules

Materials: 2 flashlights (one covered with red transparency, one blue, *Aims* H_2O molecule)

Procedures:

1. Wear *AIMS* water molecules made in the previous activity
2. Use flashlights to demonstrate effects of temperature
   a. As molecules heat up, they move faster and occupy more space (liquid/gas)
   b. As molecules cool down, they move slower and occupy less space

Evaluation: Assess student abilities to demonstrate water molecule behavior accurately

SOL: Science: 5.1 Plan and conduct investigations
5.4 Study matter (effect of temperature on states of matter)
Math: 5.11 Appropriate measuring devices

5.12 Amount of elapse time
5.17 Collect, organize, and display data

Lesson 9: Sound Transmission

Motion of the Ocean: *What is a Wave?* Chris Arvetis

Objective: Students will investigate and understand how sound is transmitted and used as a means of communication in the ocean

Materials: 6 "slinky's" to demonstrate wave action, bulletin board paper, markers, cm tapes

Procedures:

1. Read *Island of the Blue Dolphins*, Scott O'Dell
2. Perform "Island of the Blue Dolphins" activity:
   a. Draw wave action
   b. Write wave poetry
   c. (Optional) Use a computer graphics program to design a wave for your poem
   d. Present your poem to the class
3. Measure the height, amplitude, and wavelength of a simulated wave

Evaluation: Assess student abilities to accurately demonstrate wave action using a slinky.

SOL:
- Science: 5.1 Plan and conduct investigations
  5.2 Sound transmission (frequency, waves, wavelength)
- Math: 5.3 Solve problems involving computation and estimation
  5.11 Appropriate measuring devices
  5.17 Collect, organize, and display data
- Computer/Technology: 5.2 Develop basic technology skills
  5.4 Communicate through application software
- English/Oral Language: 5.1 Discussions
  5.3 Planned oral presentations
- Reading/Literature: 5.5 Literary forms
  5.6 Comprehension of a variety of literary forms
- Writing: 5.7 Write for a variety of purposes

Lesson 10: Biological Characteristics

Coasts and Shoreline Communities

Naturescope: Diving Into Oceans (pp. 36-51)

Objective: Students will investigate and understand the biological characteristics (ecosystems) of the ocean environment

Materials: seashell collection, copy beachcomber sheet

Procedures:

1. Discuss waves, tides, rocky shores, beaches, coral reefs.
   a. Repeat chant (*Naturescope*: *Diving Into Oceans* p.40)
   b. Touch, see, feel, hear seashell collections.
2. Be a Beachcomber (copy sheet)
   - Identify the numbered species from the touch table.
3. Read: *Seashore Animals,* Michael Chinery
   House for Hermit Crab, Eric Carle (Big Book)

a. Compare the fiction with non-fiction accounts in the two books
b. Write "My Life as a Seashore Animal," either a fictional or nonfictional account

Evaluation: Assess student abilities to accurately identify organisms representative of ocean environments

SOL
Science: 5.1 Plan and conduct investigations
5.5 Distinguish organisms from characteristics
5.6 Study biological characteristics of ocean environments
Math: 5.3 Solve problems involving computation and estimation
5.17 Collect, organize, and display data
English/Oral Language: 5.1 Discussions
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes
Research: 5.8 Synthesize information

Lesson 11: Geological Characteristics

Time-line of Water: "Old Water" *Project WET p.* 171

Objective: Students will investigate and understand the Earth's history

Materials: 10 meters of rope, markers, tape

Procedures:

1. Earth formed about 4.5 billion years ago
2. Earth composed mainly of rock and gases (water vapor)
3. Make time line along 10 m of rope
4. Write dialogue for "Earth, This is Your Life" to accompany the Earth's history
   a. Present Earth's story to the class
   b. View *3-2-1 Contact* video "Earth is Change"

Evaluation: Assess student abilities in making an accurate time line of the Earth's history

SOL
Science: 5.1 Plan and conduct investigations
5.6 Geological characteristics of ocean environments
Math: 5.3 Solve problems involving computation and estimation
5.11 Appropriate measuring devices
5.12 Amount of elapse time
5.17 Collect, organize, and display data
English/Oral Language: 5.1 Discussions
5.2 Nonverbal communication skills
5.3 Planned oral presentations
Writing: 5.7 Write for a variety of purposes

Lesson 12: Geological Characteristics

Voyage to the Bottom of the Sea

Objective: Students will investigate and understand the Earth's surface on the ocean floor

Materials: Kitty litter, blue bulletin-board paper, pencils, markers

Procedures:

1. Compare *Twenty Thousand Leagues Under the Sea:* Jules Verne (fiction) with *The Desert Beneath the Sea,* Ann McGovern (nonfiction)
   a. Discuss why Jules Verne's novel is a classic
   b. Search (CD-ROMs such as *Magic Schoolbus on the Ocean Floor*, Internet and other library media for information
   c. Update the novel using new information about the sea
2. Construct the bottom of the sea (*Naturescope: Diving Into Oceans* p. 6)
3. Map the sea floor (*Naturescope: Diving Into Oceans* pp.12, 13)
   -(Optional) Use a computer graphics program to draw the ocean floor

Evaluation: Assess student abilities in accurately mapping the ocean floor

SOL
- Science: 5.1 Plan and conduct investigations; 5.6 Geological characteristics of ocean environments
- Math: 5.3 Solve problems involving computation and estimation; 5.11 Appropriate measuring devices; 5.12 Amount of elapse time; 5.17 Collect, organize, and display data
- Computer/Technology: 5.2 Develop basic technology skills; 5.4 Communicate through application software
- English/Oral Language: 5.1 Discussions
- Reading/Literature: 5.4 Reference materials; 5.5 Literary forms; 5.6 Comprehension of a variety of literary forms
- Writing: 5.7 Write for a variety of purposes
- Research: 5.8 Synthesize information from a variety of sources

Lesson 13: Geological Characteristics

Locate Water Journeys: "Great Water Journeys" *Project WET* p. 246

Objective: Students will investigate and understand the human impact on our changing Earth

Materials: Pencil, copies of "Water Journey Trivia Clues and Summaries, encyclopedia, global map, world atlas, wall map

Procedures:

1. Read: *Seabird,* Clancy Holling
   a. Map the flight of the seabird
   b. Research another seabird's flight (e.g., albatross, Arctic tern, auk)
   c. Write about your seabird's flight
2. Play geographic water journey trivia game (use databases: Internet, CD-ROM)
3. Use global map to sketch the path subject of their cards traveled
4. Present summaries of water journeys to the class

Evaluation: Assess student presentations of water journey summaries

SOL
- Science: 5.1 Plan and conduct investigations; 5.6 Geological characteristics of ocean environments
- Math: 5.17 Collect, organize, and display data
- Computer/Technology: 5.2 Develop basic technology skills

5.3 Process, store, retrieve, and transmit electronic information
5.4 Communicate through application software

English/Oral Language: 5.1 Discussions

Reading/Literature: 5.4 Reference materials
5.5 Literary forms
5.6 Comprehension of a variety of literary forms

Writing: 5.7 Write for a variety of purposes

Research: 5.8 Synthesize information from a variety of sources

Lesson 14: Biological Characteristics

Life in the Ocean

Objective: Students will investigate and understand that organisms are made of cells and have distinguishing characteristics

Materials: Copy *Communities in Nature* p. 25, sea animal wildlife cards, pencils

Procedures:

1. Read *The Illustrated World of Oceans*, Susan Wells
   a. Research information from a variety of sources to write ocean animal clues (e.g., location, size, shape, interesting fact)
   b. Share clues with the class (e.g. similar to "21 Questions")
2. Classify sea animals.
   - Sort animal cards into vertebrate and invertebrates.
   a. Invertebrates (echinoderms, mollusks, coelentrates, arthopods)
   b. Vertebrates (fish, birds, mammals)

Evaluation: Assess student abilities to identify organisms by their distinguishing characteristics

SOL Science: 5.1 Plan and conduct investigations
5.2 Study characteristics of organisms
5.6 Study biological characteristics

Math: 5.17 Collect, organize, and display data

Computer/Technology: 5.2 Develop basic technology skills
5.3 Process, store, retrieve, and transmit electronic information
5.4 Communicate through application software

English/Oral Language: 5.1 Discussions
5.3 Planned oral presentations

Writing: 5.7 Write for a variety of purposes

Research: 5.8 Synthesize information from a variety of sources

Lesson 15: Biological Characteristics

Are You Me? Project A/W p.14

Objective: Students will investigate and understand that organisms are made of cells and have distinguishing characteristics

Materials: Marine life cards, file cards, pencils, paper

Procedures:

1. Read *Magic School Bus on the Ocean Floor,* Joanna Cole

a. Use "Magic School Bus on the Ocean Floor" CD-ROM to learn more about oceans
b. Take notes on new facts about oceans presented by Joanna Cole
c. Use the factual information to write an ocean adventure story

2. Distinguish marine life
   a. Distribute marine life cards
   b. Classify life into five kingdoms
   c. Write 5 facts about aquatic life
   d. Identify marine life from 5 clues.
3. View *Oceans: Reading Rainbow (30 min. video)*

Evaluation: Assess student abilities to identify organisms by their distinguishing characteristics

SOL
Science: 5.1 Plan and conduct investigations
5.5 Study characteristics of organisms
5.6 Study biological characteristics
Math: 5.17 Collect, organize, and display data
Computer/Technology: 5.4 Communicate through application software
English/Oral Language: 5.1 Discussions
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

Lesson 16: Biological Characteristics

"Marsh Muncher" *Project A/W* p. 58

Objective: Students will investigate and understand biological characteristics of organisms in ocean environments

Materials: 5 food tokens per participant, paper, crayons, pencils

Procedures:

1. Read *The Seashore*, Gallimard Jeunesse and Elizabeth Cohat
   a. Make a visual representation (diorama, mural, collage) of the seashore
   b. Present your seashore representation to the class
2. Simulate salt marsh ecosystem
3. Designate predators (20%) & detritus eaters (80%)
4. Explain rules: each detritus eater gets 5 food tokens; each predator must tag 10 detritus eaters to stay alive

Evaluation: Assess student abilities to demonstrate their understanding of ocean organisms during "marsh muncher" activity

SOL
Science: 5.1 Plan and conduct investigations
5.5 Study characteristics of organisms
5.6 Study biological characteristics
Math: 5.3 Solve problems involving computation and estimation
5.17 Collect, organize, and display data
English/Oral Language: 5.1 Discussions
5.2 Nonverbal communication skills
5.3 Planned oral presentations

Lesson 17: Characteristics of Organisms

Macro invertebrate Mayhem Project *WET* p. 322

Objective: Students will investigate and understand the relationships between invertebrate organisms

Materials: Clay, research sources, note cards

Procedures:

1. Read *Animals of the Seashore,* Charles Roux
   a. Use clay to sculpture an animal of the seashore
   b. Research the animal using a variety of sources (CD-ROM, Internet, and other library media)
   c. Give an oral presentation on your animal
2. Illustrate how macro-invertebrate populations indicate water quality
3. Review conditions necessary for a healthy ecosystem (i.e., populations of macro invertebrates=caddis fly, mayfly, stonefly, dragonfly, damselfly larva p. 327)
4. Research Macro invertebrate & report to the class
5. Play "survival" game by crossing a field without being "tagged" (stressors)

Evaluation: Assess student abilities to demonstrate understanding of macro invertebrate organisms in a report and survival game.

SOL

Science:	5.1 Plan and conduct investigations
	5.5 Study characteristics of organisms
Math:	5.3 Solve problems involving computation and estimation
	5.17 Collect, organize, and display data
Computer/Technology:	5.2 Develop basic technology skills
	5.3 Process, store, retrieve, and transmit electronic information
	5.4 Communicate through application software
English/Oral Language:	5.1 Discussions
	5.3 Planned oral presentations
Writing:	5.7 Write for a variety of purposes
Research:	5.8 Synthesize information from a variety of sources

Lesson 18: Cells

Living Systems "Micro Odyssey" *Project A/W* P. 64

Objective: Students will investigate and understand that organisms are made up of cells

Materials: Microscopes, plant and animal slides, 1" grid paper, pencil

Procedures:

1. Read *Greg's Microscope,* Barbara Gregorich
   a. Discuss how Greg used the microscope
   b. Write a description of how to use a microscope
   c. Demonstrate how to use a microscope
3. Examine slides of cells from ocean animals and plants
   a. Sketch a plant and animal cell (cell wall, cell membrane, nucleus)
      - (Optional) Use a computer graphics program to design the cell

b. Label the parts of each

4. Make scale drawings of cells

Evaluation: Assess student abilities to accurate sketch and label the parts of a cell

SOL
Science: 5.1 Plan and conduct investigations
5.5 Study characteristics of organisms
Math: 5.3 Solve problems involving computation and estimation
5.11 Appropriate measuring devices
5.15 Identify the ordered pair of coordinates
5.17 Collect, organize, and display data
Computer/Technology: 5.2 Develop basic technology skills
5.4 Communicate through application software
English/Oral Language: 5.1 Discussions
5.2 Nonverbal communication skills
5.3 Planned oral presentations
Writing: 5.7 Write for a variety of purposes

Lesson 19: Light

Animal Adaptations in the Sea

Objective: Students will investigate and understand physical characteristics of oceans

Materials: 2 bottles, 2 balloons

1. Read *The Underwater Alphabet Book*, Jerry Pallotta
   a. Research marine life
   b. Compare several alphabet books
   c. Write your own alphabet pop-up book
   d. Share your alphabet book with a younger student
2. View *3-2-1 Contact: The 3D Sea (*pp. 27, 28 in teacher's guide).
   a. Experiment with gases in water (2 bottles, 2 balloons)
   b. Problem solve why cold water holds more gases.
3. Discuss the ocean, top to bottom
   a. Sunlight zone (plant life) ends about 300 feet.
   (drifter, swimmers, plankton)
   b. Mid-water (twilight zone) extends from 600 to 3000 feet.
   (animals only, bioluminescence)
   c. Dark Deep Sea (midnight zone) 3/4 of ocean
   (slow-stunted predators, super scavengers, desert floor)
   d. (Optional) Design the ocean layers using a computer graphics program
3. Make "Pull-Through" scope ocean zones
   (Run pp.32, 35 *Naturescope*)

Evaluation: Assess student abilities to accurately design a scope of ocean zones

SOL
Science: 5.1 Plan and conduct investigations
5.3 Study characteristics of white light
5.4 Study characteristics of organisms
Math: 5.3 Solve problems involving computation and estimation
5.11 Appropriate measuring devices

5.12 Amount of elapse time
5.17 Collect, organize, and display data
Computer/Technology: 5.2 Develop basic technology skills
5.4 Communicate through application software
English/Oral Language: 5.3 Planned oral presentations
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

Lesson 20: Biological Characteristics

Whale Research: *Whales: Evan-Moore*

Objective: Students will research an ocean organism in-depth

Materials: Rope, measuring tapes, trundle wheel

Procedures:

1. Read the novel *Why the Whales Came,* Morpurgo
   a. Do the activity "Why the Whales Came" from *UNITES* V2 (5) p. 130
   b. Explain how the whale's survival was linked to the islanders of Scilly
2. Read *Big Book Magazine: Whales* (Scholastic)
   a. Make comparisons between baleen and toothed whales
   b. Begin whale research
3. Assignment:
   -Choose one whale from these types:
   a. Baleen Whales (Mysticeti)
   b. Toothed Whales (Odontoceti)
   c. Extinct Whales (Archaeoceti)
   d. Report information
   -Name of Whale
   -Where does it live?
   -How big does it grow?
   -Is it toothed or have baleen?
   -What does it eat?
   -Is it an endangered or threatened species?
   -Other Special Facts
   -List Sources of Information (library, CD ROMs, Internet)
4. Send report to:
   Whales@virginia.edu
5. Identify whales by their lengths (run p. 5 whale sizes)
   (fin, sperm, right, humpback, gray, orca)
   a. Use ropes in whale lengths.
   b. Use measuring tapes or trundle wheels to determine lengths.
6. Learn words from whale glossary
   -baleen, barnacle, blowhole, blubber, breaching, echolocation, calf, endangered, fluke, krill, lotailing, migration, orca, plankton, pod, porpoise, scrimshaw,
7. View: *Humphrey the Humpback Whale: Reading Rainbow video (30 min)*

Evaluation: Assess student understand of whales based on their research paper

SOL

Science:	5.1 Plan and conduct investigations
	5.6 Biological characteristics & human impact on oceans
Math:	5.3 Solve problems involving computation and estimation
	5.11 Appropriate measuring devices
	5.17 Collect, organize, and display data
Computer/Technology:	5.2 Develop basic technology skills
	5.3 Process, store, retrieve, and transmit electronic information
	5.4 Communicate through application software
English/Oral Language:	5.1 Discussions
	5.3 Planned oral presentations
Reading/Literature:	5.4 Reference materials
Writing:	5.7 Write for a variety of purposes
Research:	5.8 Synthesize information from a variety of sources

Lesson 21: Biological Characteristics

"Whale of a Tale" A/W p.26

Objective: Students will investigate and understand distinguishing characteristics of a vertebrate animal, the whale

Materials: Rope, sidewalk chalk, pencils, portfolio

Procedure:

1. Read poetry: *Sea Full of Whales,* Richard Armour
   -Write "Whale Poetry": *Whales: Evan-Moore (pp.28,29)*
   a. Whale Haiku (5, 7, 5 syllables)
   b. Descriptive and shaped poem
2. Design a blue whale to scale
   a. (Optional) Use a computer graphics program to design a blue whale
   b. Grid pavement (100 ft x 40 ft) with chalk
   c. Give each student a section to draw (Grid sheet.
   d. Draw the blue whale to scale on pavement.
3. Share information about the whale
4. Match whale lengths to rope lengths (*A Unit About Whales: Evan-Moor*)

Evaluation: Assess student abilities to design a blue whale to scale and share information about it

SOL

Science:	5.1 Plan and conduct investigations
	5.6 Biological characteristics
Math:	5.3 Solve problems involving computation and estimation
	5.11 Appropriate measuring devices
	5.15 Identify the ordered pair of coordinates
	5.17 Collect, organize, and display data
Computer/Technology:	5.2 Develop basic technology skills
	5.3 Process, store, retrieve, and transmit electronic information
	5.4 Communicate through application software
English/Oral Language:	5.1 Discussions

5.3 Planned oral presentations
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

Lesson 22: Sound Transmission

Objective: Students will investigate and understand how sound is transmitted and is used as a means of communication

Materials: Copy echolocation sheet, cm graph paper, pencil, colored pencils

Procedures:

1. Read: *The Whale's Song,* Dyan Sheldon
   a. Discuss the myth Lilly's grandmother told her about the whales
   b. Use a dream sequence to write your own sea animal's song
2. Listen to sounds of the humpback whale (record).
3. Experiment with sound waves (wood=3850 m/per sec. water = 1500 m/per/sec, & air=331 m/per/sec)
   a. Chart this information on a bar graph
   b. Stand 25 ft away from the building
   c. Echo is produced when sound waves bounce back from an object.
4. Calculate the distance objects are away from a whale by the amount of time it takes the echo to travel back to it = echolocation
5. **Echolocation:** sound waves travel at 1,500 m/per/sec.in salt water
   -time it takes the sound (sonar echo) to return is 2x the rate it travels
   echo speed: depth=750 m/per/sec x number of seconds
6. View "Whales: National Geographic" video
7. Use the electronic data bases (CD-ROM, Internet, other library media) to find out more about echolocation

Evaluation: Assess student abilities to calculate echolocation using an equation

SOL
Science: 5.1 Plan and conduct investigations
5.2 Study sound transmission (sonar, animal sounds, echolocation)
Math: 5.3 Solve problems involving computation and estimation
5.11 Appropriate measuring devices
5.12 Amount of elapse time
5.16 Solve problems involving probability
5.17 Collect, organize, and display data
5.19 Investigate numerical and geometric patterns
Computer/Technology: 5.2 Develop basic technology skills
5.3 Process, store, retrieve, and transmit electronic information
5.4 Communicate through application software
English/Oral Language: 5.1 Discussions
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

Lesson 23: Matter

Whale and Other Mammals' Insulation:

(minimizes the loss of energy)

Objective: Students will investigate and understand the effect of temperature on the states of matter

Materials: Resealable sandwich plastic bag, Crisco, feathers, soil, water, cotton, thermometer, gallon-size resealable bag, water

Procedures:

1. Read for comparison:
   The Sea Otter, Maggie Blake
   Dancing with Manatees, Faith McNulty
   Whales, the Gentle Giants, Joyce Milton
   a. Select an animal to research
   b. Tell why you chose that animal
2. Write a sea mammal report
3. Perform insulation experiment (experiment sheets):
   a. Fill resealable bag with insulators, one each (Crisco=blubber, feathers, soil, water, cotton)
   b. Record the temperature before the experiment
   c.. Place thermometer inside the bag.
   d. Record the temperature after being placed in a gallon-size bag filled with cold water
   e. Graph results.(Which best insulator? Why?)
   -(Optional) Record data on a computer graphics program
4. Why did 14,000 sea otters die in 1987 oil spill? (no blubber).

Evaluation: Assess students abilities to accurately record and graph insulation experiment

SOL

Science:	5.1 Plan and conduct investigations
	5.4 Study matter (insulation)
	5.6 Changing Earth's surface (human impact)
Math:	5.3 Solve problems involving computation and estimation
	5.11 Appropriate measuring devices
	5.12 Amount of elapse time
	5.17 Collect, organize, and display data
Computer/Technology:	5.2 Develop basic technology skills
	5.4 Communicate through application software
English/Oral Language:	5.1 Discussions
	5.3 Planned oral presentations
Reading/Literature:	5.4 Reference materials
Writing:	5.7 Write for a variety of purposes
Research:	5.8 Synthesize information from a variety of sources

Lesson 24: Matter : Insulation

"Cold Cash in the Icebox" *WET* p. 373

Objective: Students will investigate and understand the effect of temperature on states of matter

Materials: *UNITES* lab sheet and insulation container pp. 106-107, pint milk carton, egg carton, newspaper, tape

Procedures:

1. Read *Julie of the Wolves,* Jean Craighead George
   a. Do "Julie of the Wolves" activities *UNITES V2* (5) p. 104
   b. Imitate the nonverbal communication Julie has with the wolves (e.g. play "Wolf Charades" and try to guess Julie's message)
   c. Rewrite Julie's arctic adventure into your own survival story
2. Choose from a variety of packaging materials
3. Place ice cube inside a plastic bag in the container
4. Graph the amount of melt in milliliters after intervals (*WET* p. 376)
   -(Optional) Record data a computer graphics program

Evaluation: Assess student abilities to design and construct insulators that minimize the transfer of energy

SOL

Science:	5.1 Plan and conduct investigations
	5.4 Study matter (insulation)
Math:	5.3 Solve problems involving computation and estimation
	5.11 Appropriate measuring devices
	5.12 Amount of elapse time
	5.17 Collect, organize, and display data
Computer/Technology:	5.2 Develop basic technology skills
	5.4 Communicate through application software
English/Oral Language:	5.1 Discussions
	5.2 Nonverbal communication skills
Reading/Literature:	5.5 Literary forms
	5.6 Comprehension of a variety of literary forms
Writing:	5.7 Write for a variety of purposes

Lesson 25: Ocean Environments

"Turtle Hurdles" *Project A/W* p. 164

Objectives: Students will understand the biological characteristics of an ocean organism, the sea turtle

Materials: Playing field (gym or outdoors), hole punch, index cards, string

Procedures:

1. Read *Sea Turtles*, Caroline Arnold
   a. Compare the 10-year life cycle of the sea turtle to another marine animal (e.g., eel, salmon)
   b. Draw the life cycle of the sea turtle
   c. Share illustrations with the class
2. Identify factors related to sea turtle mortality

3. Set up 10-year life cycle of sea turtles
4. Examine endangerment of sea turtles (6 out of 7 sea turtles)

Evaluation: Assess student abilities to accurately portray the life cycle of a sea turtle

SOL
Science: 5.1 Plan and conduct investigations
5.6 Study biological characteristics & human impact on oceans
Math: 5.3 Solve problems involving computation and estimation
5.12 Amount of elapse time
5.17 Collect, organize, and display data
English/ Oral Language: 5.1 Discussions
5.2 Nonverbal communication skills
5.3 Planned oral presentations

Lesson 26: Ocean Environments

"Hooks and Ladders" *Project A/W* p. 69

Objectives: Students will understand the biological characteristics of an ocean organism, the salmon

Materials: Hula hoops, jumpropes, pennies, boxes

1. Compare fictional with nonfictional accounts of salmon by reading *Come Back Salmon,* Molly Cone and *Swimmer,* Shelley Gill
   a. Make a list of all the things kids did to improve salmon habitat in the book *Come Back Salmon*
   b. Choose a literary form (poem or prose) to tell the story of the salmon
2. Study salmon populations
   a. Discuss life cycle of salmon (egg, alevin, fry, smolt, adult).
   b. Run obstacle course outdoors
3. Use electronic data bases (CD-ROM, Internet, other library media) to research salmon

Evaluation: Assess student abilities to survive the life cycle as salmon

SOL
Science: 5.1 Plan and conduct investigations
5.6 Biological characteristics & human impact on oceans
Math: 5.3 Solve problems involving computation and estimation
5.11 Appropriate measuring devices
5.12 Amount of elapse time
5.17 Collect, organize, and display data
Computer/Technology: 5.2 Develop basic technology skills
5.3 Process, store, retrieve, and transmit electronic information
5.4 Communicate through application software
English/Oral Language: 5.1 Discussions
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

Lesson 27: Ocean Environments

Oil Pollution, Pollution Prevention, Restoration

Objective: Investigate and understand biological characteristics (ecosystems); and public policy decisions related to the ocean environment, including assessment of marine organism populations and pollution prevention

Materials: Flex tanks, wooden sticks, turkey basters, cups, vegetable oil with pepper added, masking tape

Procedures:

1. Read *Prince William,* Gloria Rand
2. Do activity "Prince William"*UNITES V2 (4) p. 80*
   a. Give a written description of how to care for an animal caught in an oil spill
   b. Compare how sea otters where cared for in *Prince William* with *Island of the Blue Dolphins.*
3. Simulate an oil spill in Prince William Sound
   -Clean up the oil spill (booms=wooden sticks, skimmer=turkey basters, basins=cups) using properties of matter (density, adhesion, dispersion)
4. View "Alaska's Oil Spill" video
   View "Exxon's" video
5. Write a reaction paper to the oil crisis
6. Link to "OceanQuest" from this URL under "Our Favorite Bookmarks": http://www.bev.net/education/schools/ces/

Evaluation: Assess student successes in cleaning up oil in another situation (e.g., the Chesapeake Bay)

SOL

Science:	5.1 Plan and conduct investigations
	5.6 Biological characteristics & human impact on oceans
Math:	5.3 Solve problems involving computation and estimation
	5.11 Appropriate measuring devices
	5.17 Collect, organize, and display data
Computer/Technology:	5.2 Develop basic technology skills
	5.3 Process, store, retrieve, and transmit electronic information
	5.4 Communicate through application software
English/Oral Language:	5.1 Discussions
Reading/Literature:	5.5 Literary forms
	5.6 Comprehension of a variety of literary forms
Writing:	5.7 Write for a variety of purposes

Lesson 28: Characteristics of Organisms

Assessment of Fish Populations

Objective: Students will investigate and understand that organisms have distinguishing characteristics and adaptations

Materials: Copy *Project A/W* pp.90-91, markers, T-shirts or paper, tempera paint, paint brush, Nasco fish forms

Procedures:

1. **"Fashion a Fish"** *Project A/W p. 88*
   a. Design an ocean fish
   b. Present fish adaptations
2. Read *Swimmy,* Leo Lionni and *Big Al,* Andrew Yoshi
   a. Compare the writing styles in the two books
   b. Write the solution to the problem before read the books' endings
3. Make fish impressions on T-shirts or paper
   -Examine *Gyotaku Fish Impressions: The Art of Japanese Printing*, Olander

Evaluation: Assess student abilities to accurately design an ocean fish

SOL
Science: 5.1 Plan and conduct investigations
5.5 Study characteristics of organisms
Math: 5.3 Solve problems involving computation and estimation
5.11 Appropriate measuring devices
English/Oral Language: 5.1 Discussions
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

Lesson 29: Biological Characteristics of Ocean Environments

Objective: Student will investigate and understand biological characteristics and public policy decisions related to marine organism populations

Materials: Assorted beans (lima, split pea, kidney, black beans), netting, jar rims

1. Read *Ibis, a True Whale Story,* John Himmelman
   a. Discuss how netting affects sea life
   b. Find other examples of netting fatalities (dolphins)
   c. Begin research on the history of netting using a variety of sources
2. **"Net Gain, Net Loss"** *Project A/W p.104*
   a. Determine netting effects on different species
   b. Discuss changes in netting technology
   c. Write new netting regulations
   d. Research effects of netting on marine Animals using electronic data bases (CD-ROM, Internet, other library media)

Evaluation: Assess student abilities to accurately determine the effects of netting different species

SOL
Science: 5.1 Plan and conduct investigations
5.6 Biological characteristics of ocean environments
Math: 5.3 Solve problems involving computation and estimation
5.11 Appropriate measuring devices
5.17 Collect, organize, and display data
Computer/Technology: 5.2 Develop basic technology skills
5.3 Process, store, retrieve, and transmit electronic information
5.4 Communicate through application software
English/Oral Language: 5.1 Discussions
Reading/Literature: 5.4 Reference materials

Writing: 5.7 Write for a variety of purposes
Research: 5.8 Synthesize information from a variety of sources

Lesson 30: Biological Characteristics of Ocean Environments

Objective: Student will investigate and understand biological characteristics and public policy decisions related to marine organism populations

Materials: Flex tanks, vegetable oil, eye dropper, solvents (detergent, lighter fluid, vinegar), hand lens

Procedures:

1. Identify ways an oil spills affects waterfowl
2. Read *A Tale of Antarctica,* Ulco Glimmerveen
   a. Draw a picture of the Antarctica scenery from the description at the beginning of the book
   b. Describe how the Antarctica scene changed with humans
3. **"No Water Off a Duck's Back"** *Project WILD* p. 274
4. Experiment:
   a. Divide the class into groups of four
   b. Examine a feather with a hand lens and draw its structure
   c. Dip the feather in water covered with one tablespoon of vegetable oil
   e. Clean the feather in different solvents (detergent, lighter fluid, vinegar) rinse in water, and dry it
   f. Examine with a hands lens and compare
5. Discuss the effectiveness of the different solvents
6. Discuss the impact of oil pollution on other wildlife species

Evaluation: Assess student abilities to use discuss the impact of pollution on marine species

SOL

Science: 5.1 Plan and conduct investigations
5.6 Biological characteristics of ocean environments
Math: 5.3 Solve problems involving computation and estimation
5.11 Appropriate measuring devices
5.12 Amount of elapse time
5.17 Collect, organize, and display data
English/Oral Language: 5.1 Discussions
5.2 Nonverbal communication skills
Reading/Literature: 5.5 Literary forms
5.6 Comprehension of a variety of literary forms
Writing: 5.7 Write for a variety of purposes

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