

EXPLORING THE DEEP SEA

Fourth Grade

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Exploring the Deep Sea

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3. Ask the students to think about how the ocean's waters differ at each zone or level.
Example: surface waters vs. deep ocean waters.
Have the students read the *Background* section, pages 427-8, with you. Discuss the information.
4. Inform the students that they will be making a pull-through strip—*Who's Who in the Zones*. The strip shows some of the creatures found at each zone (depth).
5. At the end of the activity, have the students write in their journals about what they learned during today's lesson.

Extension: Divide the class into three groups and have them create a mural which will represent the three zones of the ocean.

Materials: butcher paper, tempera paints, brushes, reference materials, pictures of various ocean animals, art supplies for creating the sea creatures

(Can be done over a period of a days. It is not a one-day activity.)

Deep Sea

Day Two—Depth Line

Concept: The students will learn how deep sea exploration has changed over time. New technology makes the deep sea more accessible to us.

Science Standards:

Investigation and Experimentation:

- 6.0 Scientific progress is made by asking meaningful questions and conducting careful investigations.
 - a. Students will differentiate observations from inference (interpretation) and know that scientists' explanations come partly from what they observe and partly from how they interpret their observations.
 - c. Students will follow a set of written instructions for a scientific investigation.

English-Language Arts Content Standards:

Reading:

- 2.0 Reading Comprehension—Students will read and understand grade-level-appropriate material.

Writing:

- 1.0 Writing Strategies—Students write clear and coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose.

Math Content Standards:

Number Sense:

- 3.0 Students will solve problems involving addition, subtraction, multiplication, and division of whole numbers and understand the relationships among the operations.

Statistics, Data Analysis, and Probability

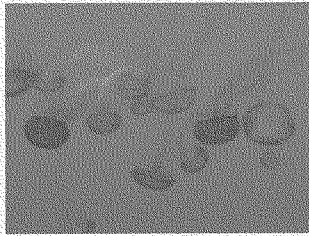
- 1.0 Organize, represent, and interpret numerical and categorical data and clearly communicate their findings.



Materials: Per Student—adding machine tape; 1 piece, 4 meters in length, metric ruler, pencil, markers, *Deep Water Discovery Data Sheet*

- Procedure:**
1. Introduce the new vocabulary: salvage ships, submarine, bathyspheres, buoyant, bathyscaph, submersibles
 2. Inform the students about the activity they will be involved in shortly.
 3. Give each student the materials needed, including a set of *Depth Line* pages 111-4. Review the *Procedures* section for the activity and check for understanding.
 4. Allow the students approximately 20 minutes to complete their depth line.
 5. Introduce page 113, *Analysis and Interpretation* to the students. Students are to complete this sheet independently.
 6. Discussion—Allow the students to share their responses to the *Analysis and Interpretation* sheet. Also, discuss what they learned by making the *Depth Line*.

Deep Sea Day 3--Pressure



Concept: Internal and external pressure must be balanced for an object (creature) to retain its shape.

Science Standards

Life Sciences:

3.0 Living organisms depend on one another and their environment for survival.

Investigation and Experimentation:

6.0 Scientific progress is made by asking meaningful questions and conducting care investigations.

English-Language Arts Content Standards

Reading:

2.0 Reading Comprehension—Students will read and understand grade-level-appropriate material.

Writing:

1.0 Writing Strategies—Students write clear and coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose.



Materials: Vocabulary chart/word cards: pressure, submersibles, atmospheric pressure, compress, gas bladder, trench, adjust, migrate, metabolism; a straw and cup of water for every student, two milk cartons—one half-gallon size and 1 one quart-size, pencil, tape, deep pan, water, a copy of *The Scientific Method: Science Project Guide* for each student

- Procedure:**
1. Introduce the vocabulary.
 2. Give each student a copy of *The Scientific Method*. Review the steps with the students. Before beginning each experiment, have the students identify and record the problem, materials, procedures, and hypothesis in their science journals. After the experiment has been conducted, have the students record their observations, analyze the data, and draw a conclusion.

Using page 94 as a guide, *Deep Sea Canyon*, conduct the two experiments.

3. Discuss the experiment and the students' conclusions.



The Scientific Method

Science Project Guide

Things to do:

1. State the **problem** (What do I want to find out?)
2. List **materials** (What materials do I need?)
3. Outline **procedures** (What will I do with the materials? --step by step)
4. Form a **hypothesis** (What do I believe will happen?)
5. Record **observations** (What really did happen?)
6. Analyze **data** (Why did this happen?)
7. Draw a **conclusion** (Did I find out what I wanted to know?)



Deep Sea

Day 4—How Low Can You Go?

Concepts: Pressure increases with depth in the ocean. Water pressure pushes on a submerged object equally in all directions. Internal and external pressure must be balanced for an object to retain its shape.

Science Standards

Life Science:

3.0 Living organisms depend on one another and on their environment for survival.

Investigation and Experimentation:

6.0 Scientific progress is made by asking meaningful questions and conducting careful investigations.

- a. Students will differentiate observations from inference (interpretation) and know that scientists' explanations come partly from what they observe and partly from how they interpret their observations.
- c. Students will follow a set of written instructions for a scientific investigation.

English-Language Arts Content Standards

Reading:

2.0 Reading Comprehension—Students will read and understand grade-level-appropriate material.

Writing:

1.0 Writing Strategies—Students write clear and coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose.



Math Content Standards:

Number Sense:

- 1.0 Students understand the place value of whole numbers and decimals to two decimal places and how whole numbers and decimals relate to simple fractions.

Statistics, Data Analysis, and Probability

- 1.0 Organize, represent, and interpret numerical and categorical data and clearly communicate their findings.



Materials: *How Low Can You Go?* activity pages for each student
From For SEA, Unit 4

- Procedure:**
1. Review the vocabulary words: surface area, pressure, hypothesize, trench, bottom dwelling, cubic, structure.
 2. Give each a student a copy of the activity pages. Divide the class into small groups and allow them to work as a team.
 3. Discuss and review the correct answers.

Deep Sea
Day 5—Filtered Light



Concept: Objects may reflect, absorb, or allow light to pass through: the light an object reflects determines the color of the object. Colored filters allow only that color light to pass through.

Science Standards
Life Sciences:

- 3.0 Living organisms depend on one another and their environment for survival.
 - a. Students know ecosystems can be characterized by their living and nonliving components.

Investigation and Experimentation:

- 6.0 Scientific progress is made by asking meaningful questions and conducting care investigations.

English-Language Arts Content Standards

Reading:

- 2.0 Reading Comprehension—Students will read and understand grade-level-appropriate material.

Writing:

- 1.0 Writing Strategies—Students write clear and coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose.
- 2.0 Writing Applications—Students write compositions that describe and explain familiar objects, events, and experiences.



Materials: red, green, and blue acetate (one sheet of each color), scotch tape, hole punch, scissors, flashlights, darkened room (the room does not need to be completely dark)

a 3x5 index card, a 9x12 sheet of black construction paper, a 9x12 sheet of white construction paper, markers—red, green, and blue, and *Properties of the Deep Sea* pages 121-125 for each student

- Procedure:**
1. Make a K-W-L chart—What do you know about light in the deep ocean?
 2. Read pages 121-2 with the students. Discuss the information
(Vocabulary: visible spectrum, tessellation)
 3. Inform the students that there are four parts to this activity and they must be done in a specific order. Begin part 1 of the activity as a whole group. As the students complete each activity, continue to move on as a whole group until all the activities have been completed.
 4. Final activity—The students are to write a composition describing/explaining what they learned about deep sea light during the lesson.

Deep Sea

Day 6—Designing Deep Sea Life



Concepts: Some scientific theories develop from observations and deductive reasoning. Theories and hypotheses are revised as new information becomes available.

Science Standards

Life Science:

- 3.0 Living organisms depend on one another and on their environment for survival.
 - b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

Investigation and Experimentation:

- 6.0 Scientific progress is made by asking meaningful questions and conducting careful investigations.
 - a. Students will differentiate observations from inference (interpretation) and know that scientists' explanations come partly from what they observe and partly from how they interpret their observations.
 - c. Students will follow a set of written instructions for a scientific investigation.

English-Language Arts Content Standards

Reading:

- 2.0 Reading Comprehension—Students will read and understand grade-level-appropriate material.

Writing:

- 1.0 Writing Strategies—Students write clear and coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose.

Visual Arts

Creative Expression:

- 2.0 Students apply artistic processes and skills, using a variety of media to communicate meaning and intent in original artworks.



Materials: paper, paint/colored pencils/crayons/felt markers, scissors, miscellaneous art supplies

Procedure: 1. Review the vocabulary words:

behavioral adaptations—specific behaviors that organisms carry out that help them survive: birds building nests, wolves marking their territory are examples of behavioral adaptations

organism—a form of life considered as an entity; an animal, plant, fungus, protistan, or moneran

physical adaptations—body structures or parts that help an organism survive: large eyes, protective coloration, sharp claws or examples of physical adaptations

(From FOR SEA) *From 4 Sea Unit 4*

2. Read pages 139-140 with the students. Review the procedures. Allow the students to work independently. Encourage students to be creative, but to think about what an organism requires to survive in the deep sea environment.
3. Share the artwork and explanation of how/why their creature will survive.

Deep Sea
Day 7—Animal Adaptations
Part 1

Concept: Deep sea animals have special adaptations which help them survive in their habitat.

Science Standards

Life Sciences:

- 3.0 Living organisms depend on one another and their environment for survival.
 - a. Students know ecosystems can be characterized by their living and nonliving components.

Investigation and Experimentation:

- 6.0 Scientific progress is made by asking meaningful questions and conducting care investigations.

English-Language Arts Content Standards

Reading:

- 2.0 Reading Comprehension—Students will read and understand grade-level-appropriate material.

Writing:

- 1.0 Writing Strategies—Students write clear and coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose.

Listening and Speaking:

- 2.0 Students deliver brief recitations and oral presentations about familiar experiences or interests that are organized around a coherent thesis statement.



Materials: set of deep sea animal picture cards, adaptation data sheet, dice, drawing paper, markers

Procedure:

1. Read pages 157-8 with the students. Discuss the information
(Vocabulary: visible spectrum, tessellation)
2. Inform the students that they will analyze pictures of deep sea creatures in order to identify its special adaptations. Introduce the *Data Sheet* and procedure to be followed when filling it out.

Deep Sea

Concept: Using his/her completed data sheet, each student will analyze and interpret his/her creation's adaptations that will ensure survival.

Science Standards

Life Science:

- 3.0 Living organisms depend on one another and on their environment for survival.
 - b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

Investigation and Experimentation:

- 6.0 Scientific progress is made by asking meaningful questions and conducting careful investigations.
 - a. Students will differentiate observations from inference (interpretation) and know that scientists' explanations come partly from what they observe and partly from how they interpret their observations.
 - c. Students will follow a set of written instructions for a scientific investigation.

English-Language Arts Content Standards

Reading:

- 2.0 Reading Comprehension—Students will read and understand grade-level-appropriate material.

Writing:

- 1.0 Writing Strategies—Students write clear and coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose.

Visual Arts

Creative Expression:

- 2.0 Students apply artistic processes and skills, using a variety of media to communicate meaning and intent in original artworks.



Materials: students' completed data sheets, a pair of dice, crayons/colored pencils, felt markers, drawing paper, hand-out pages 158b-159

- Procedure:**
1. Review the instructions on pages 158b and 159, which inform the students about how they will create a new species of deep sea creature.
 2. Give each student pages 158b and 159 and other materials needed.
 3. Remind the students to work independently.
 4. After the students have drawn their new creation, have the students share these creations and identify the adaptations that will allow their new species to survive in the deep sea.
 5. Allow the students to share and discuss the *Analysis and Interpretation* section of the activity.

Deep Sea

Day 9—Bioluminescence



Concept: Bioluminescence, the ability of an organism to produce light, is a special adaptation found in many deep sea organisms which helps them survive in their habitat.

Science Standards

Life Sciences:

- 3.0 Living organisms depend on one another and their environment for survival.
 - a. Students know ecosystems can be characterized by their living and nonliving components.
 - b. Students know producers and consumers are related in food chains and food webs and may compete with each other for resources in an ecosystem.

Investigation and Experimentation:

- 6.0 Scientific progress is made by asking meaningful questions and conducting care investigations.

English-Language Arts Content Standards

Reading:

- 2.0 Reading Comprehension—Students will read and understand grade-level-appropriate material.

Writing:

- 1.0 Writing Strategies—Students write clear and coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose.



Materials: vocabulary cards—adaptation, appendage, bioluminescence, lateral line, photophore; small flashlights or penlights for each student (you make want to ask students to bring flashlights or penlights from home), give each student a copy of pages 171-175, for better results—students should wear dark clothing for this activity, one free-standing lamp with a 25-watt light bulb

- Procedure:**
1. Ask students what they know about bioluminescence.
 2. Introduce the vocabulary words.
 3. Give each student a copy of pages 171-175. Read pages 171-172 with the students. Discuss the information.
 4. Review the procedures of the activity with the students. For clarification, read *Teaching Hints* on page 166. Check for understanding.
 5. Begin the first activity. Before answering the questions for each activity, have the students identify, on their papers, whether they were part of the *movement group* or *mapping group*.
 6. After each activity, give the students the opportunity to answer the corresponding questions.
 7. Discuss the students' answers to the questions, their findings, and concerns.

Extension: Using dark T-shirts and glow-in-the-dark paints, have the students create a *bioluminescent* fish shirt.

Deep Sea

Day 10—Hydrothermal Vents



Concept: A complex community of living things survives at hydrothermal vents without sunlight.

Science Standards

Life Science:

3.0 Living organisms depend on one another and on their environment for survival.

- b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

Investigation and Experimentation:

6.0 Scientific progress is made by asking meaningful questions and conducting careful investigations.

- a. Students will differentiate observations from inference (interpretation) and know that scientists' explanations come partly from what they observe and partly from how they interpret their observations.
- c. Students will follow a set of written instructions for a scientific investigation.

English-Language Arts Content Standards

Reading:

2.0 Reading Comprehension—Students will read and understand grade-level-appropriate material.



Materials: *Hydrothermal Vent Critter Card* set, art paper, crayons/colored pencils/felt markers, *Cycling in the Hydrothermal Vents* pages 189-193.

- Procedure:**
1. Introduce the vocabulary: chemosynthesis, community, consumer, decomposer, food web, hydrothermal, hydrothermal vent, photosynthesis, producer, zooplankton
 2. Read *Cycling in the Hydrothermal Vents*, pages 189-191. Allow the students time to complete the questions on page 191. Discuss the information and clarify if needed.
 3. Review the instructions to *Part 1* of the activity. Provide guided practice. Allow the students enough time to complete this part before moving on to *Part 2*.
 4. Review the answers to *Part 1* before moving on to *Part 2*.
 5. Go over the instructions for *Part 2* with the students. Allow the students enough time to complete this section. (You may choose to do this activity over two days.)
 6. Review the students' answers. Have the students use their science journals to record what they have learned and any questions they may still have about life in hydrothermal vents.
 7. Have students share their responses.