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Grades 4–6

SCIENCE & STORIES

Integrating Science and Literature

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Book design by Street Level Studio.

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ISBN-13: 978-1-59647-139-9
Previous ISBN: 0-673-36084-9

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THE OCEAN

SCIENCE UNDERSTANDINGS

In this unit, students explore through literature the components of the ocean, the interactions of living things within it, and the ocean's importance to humans. The unit helps students understand the following concepts from the science curriculum.

1. The ocean contains a large variety of living things, which interact in ways to ensure their survival.
2. Humans depend on the ocean to meet many of their needs.
3. Human knowledge of the ocean is developed through a variety of scientific methods.

Unit Map

Each lesson revolves around a piece of literature, emphasizes a literary genre, and focuses on a problem that students can solve as they work through the lesson.

Lesson	Literature	Genre/Strategy	Problem
1	The Magic School Bus on the Ocean Floor	Fantasy	How does the structure of the ocean affect life in it?
2	Coral Reef	Nonfiction	How do living things in the ocean depend on one another?
3	Call It Courage	Legend	How do people depend on the ocean?
4	The Turtle Watchers	Realistic fiction	How do we learn about the ocean?

INTRODUCING THE OCEAN UNIT

1. Show a globe as you discuss how we live on a “water planet.” Show how the seas and oceans of the world are connected to form one large ocean. Explain that approximately 70% of the earth is made up of water (97% salt, 3% fresh).
 2. Invite students to create a chalkboard list headed *What We Know About the Ocean*. Encourage a wide variety of responses. After the list is completed, suggest that students organize the items on it into categories, such as *Nonliving Things in the Ocean*, *Living Things in the Ocean*, and *How Humans Use the Ocean*. Ask students to copy each categorized list on a separate sheet of poster paper.
 3. Next, ask students to think of questions under the heading *What We Want to Find Out About the Ocean*. Write the questions on the chalkboard. Then have students copy each question in the category where it belongs on their poster-paper lists.
 4. Explain that in the books in this unit, students will not only find answers to some of their questions, but will also be able to check or correct many of their “What We Know. . .” statements.
2. Explain that the book can be fiction or non-fiction, but that in the former case it should be realistic, not science fiction or fantasy. Tell students that they will be reading examples of fiction and nonfiction as they work through the unit.
 3. Suggest that as students work through each lesson, they gather and collate materials that will be helpful to them when they begin to write their books. Portfolio contents can include the lesson Study Guides, additional notes they have made, the results of their work in the extension activities that conclude each lesson, and copies of news clips from periodicals.
 4. Explain that students will work in cooperative learning groups to write their books. Students may wish to form these groups at the start of this unit. Groups can come together after each lesson, discuss the contents of members’ portfolios, and begin to develop story ideas.

INTRODUCING THE SYNTHESIS ACTIVITY

The synthesis activity gives students an opportunity to apply what they have learned about the ocean through the literature, through related work in your science curriculum, and through further research. Introduce the synthesis activity at the beginning of the units so students can plan ahead.

1. On poster paper, for display, write the objective of the activity:
Objective: To write an informative book or story about a real island, including data about its formation, the surrounding waters, the life forms in the water and on shore, and the ways in which people of the island

use and depend upon the ocean.

2. Explain that the book can be fiction or non-fiction, but that in the former case it should be realistic, not science fiction or fantasy. Tell students that they will be reading examples of fiction and nonfiction as they work through the unit.
3. Suggest that as students work through each lesson, they gather and collate materials that will be helpful to them when they begin to write their books. Portfolio contents can include the lesson Study Guides, additional notes they have made, the results of their work in the extension activities that conclude each lesson, and copies of news clips from periodicals.
4. Explain that students will work in cooperative learning groups to write their books. Students may wish to form these groups at the start of this unit. Groups can come together after each lesson, discuss the contents of members’ portfolios, and begin to develop story ideas.

CARRYING OUT THE SYNTHESIS ACTIVITY

Explain the standards you will use for evaluating the books and stories. Write standards on the chalkboard. They might include *accuracy* and *completeness* of facts; *clarity* of presentation; *neatness and accuracy* of visual materials, such as charts, drawings, maps, etc. Encourage students to suggest other standards by which they want to assess their own and their classmates’ final products. Remind students to refer often to the Standards list. Reiterate the Objective and ask students to keep it in mind as they develop their stories.

Explain again that each cooperative learning group will be responsible for creating a book. Suggest that students follow these steps.

Step 1. Use maps, the globe, and atlases to determine which island will be the setting of the story.

Step 2. Go through the portfolios to find details that can be used to describe the island and the surrounding waters. List other habitat details the group will need. Assign partners within the group to research and compile these details.

Step 3. As a group, decide whether the book will be fiction or nonfiction. If the book is fiction, decide together on the main characters, plot, key events, and resolution of the story. If the book is nonfiction, decide on the sequence in which facts will be presented.

Step 4. Assign partners to write the fiction chapters or to organize and write sections for the nonfiction book. Assign other members to make illustrations, captions, charts, maps, book covers, and other visuals.

Step 5. Assign two or three group members to act as editors and proofreaders of the group's first draft. Ask each member or partner team to make the corrections for the final draft.

Step 6. Decide on a way of presenting the book to classmates, to students in other classrooms, or to families at home. Invite the school librarian to review the books and suggest ways to share them in a library display. As students enjoy and discuss each other's books, ask them to refer to the evaluative standards and the objective.

INTEGRATION ACTIVITIES

Each lesson concludes with integrating activities to be used with the book students have just read. The following general, ongoing activities will enhance their enjoyment of the unit.

Music of the Sea

Play traditional music of sea-going people around the world. Ask students to listen for common themes and rhythms, as well as for details that are special to a particular ocean environment. To enjoy another kind of music, play some of the many tape recordings of the songs of whales and the whistles and clicks of dolphins. Suggest that students do research to find out what these sounds communicate and

what technology is used to capture the sounds on tape.

The Ocean in Art

Most libraries have art books with good quality reproductions of traditional arts and crafts of people who live by the sea. Motifs on fabric, wooden ware, and pottery often have stylized designs of waves, boats, fishes, and ocean birds and mammals. Make such books available to your students. Invite your artists to paint their own abstract designs of ocean life, to mold clay into sea shapes, and to make mobiles that simulate the motion of the sea.

Poems About the Ocean

Have on hand several poetry anthologies that include poems about the ocean. Invite students to find ocean poems and read the poems aloud to a small group of classmates. Some students may also want to write and present their own ocean poems. You might provide some practice time for students to organize a program of ocean poetry, ocean art, and ocean music.

Current Events

Assign a group of students to scan newspapers and news magazines on a regular basis to find news related to the ocean. Ask students to clip out or photocopy articles they think are important and post them on the bulletin board. Or file the clippings in an *Ocean Update* file to place in your science center. Suggest that students append their own notes to tell why they think each article is important or about how it relates to the literature in this unit.

Invite other students to read the articles and comments, then add their own on separate sheets of paper. Two or three times a week, review and discuss the latest additions to the file with the class as a whole. Point out that the file can be a source of ideas to build into the books that cooperative learning groups will be writing.

ADDITIONAL MATERIALS

For additional materials you might want to use with this unit, see Additional Resources, pages 130-134.

LESSON

1

COMPONENTS OF THE OCEAN

LITERATURE:

The Magic School Bus on the Ocean Floor

Joanna Cole (Scholastic, 1992)

SCIENCE UNDERSTANDING:

The ocean contains a large variety of living and nonliving things.

LITERARY GENRE:

Fantasy



BOOK SUMMARY

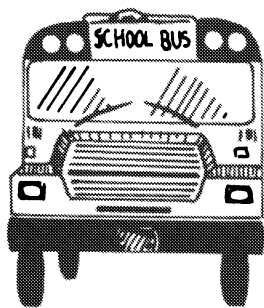
Like the other books in the *Magic School Bus* series, this volume introduces science facts in a setting of fantasy and humor. Here, the intrepid Ms. Frizzle takes her students step by watery step from the shore to the edge of the continental shelf to the deepest parts of the ocean. Along the way, her students find out about the causes of waves and tides, living things in the intertidal zone, the continental shelf, and the teeming animals and plants along this shelf. Descending to a deeper part of the ocean, the students study cold, plantless, sparsely populated depths where glowing fish get nourishment from waste products and other nutrients that rain from the upper ocean. Moving down, the students examine a hot-water vent, find out how bacteria are manufactured in the vent's heat, and find out why a profusion of life can be supported around these vents. Moving upward again, the students explore the delicate intricacies of coral reefs and the reefs' relationship to undersea volcanoes and to the formation of islands. Back in their classroom, Ms. Frizzle's students—as usual—collate their field trip findings in a giant display.

PRE-READING

This book is fun to read aloud with the entire class. For students who have not yet met Ms. Frizzle and her class in other *Magic School Bus* books, first flip through the pages to point out the many devices for presenting information: straight running text, dialogue balloons, labels, copies of students' reports, inset maps, and pictures. In spite of the slapdash look of some of the pages, the science material is all cognitively related, though some of the children's words are just wisecracks that maintain the light and breezy presentation.

1. Explain to students that along with all the fantasy in the book they will be able to find realistic answers to the following questions. (You might write the questions on the chalkboard.)
 - What are some geographical features of the ocean?
 - How do living things in the ocean get what they need to survive?
2. Distribute copies of the Study Guide. It's a chart, ending with three questions, on which students can take notes as they enjoy and listen to the story. Suggest that students write question marks in chart squares or on

answer lines when they can't guess at the answers. Explain that when they've finished reading, they'll go back into the book and find the answers.



3. Invite students to read along with you in unusual ways. For example, you might read the straight text on each page and invite students to take turns reading the other kinds of text. Ask students who read the dialogue balloons to determine whether the words give scientific data or are just for fun.

BUILDING THE SCIENCE AND LITERATURE CONNECTION

1. When you've finished reading the book, ask students to work with a partner or small group to enrich their Study Guide charts, fill in gaps, and correct errors.
2. When the charts are completed, bring the class together again to discuss and share their chart entries and answers to the questions on the Study Guide. Discuss answers to the two questions in Pre-reading. Suggest that the class refer to the Pre-reading questions and decide if their questions have been answered. Write the answers under the questions. Then have students pose other questions based on what they've read. Remind your class that good science consists not only of answering old questions, but also of coming up with new questions!
3. Ask cooperative learning groups to research and write more fully on some of the topics introduced on the "notebook" pages in *The Magic School Bus on the Ocean Floor*. Groups might find out more about the vents on the ocean floor and the scientists who discovered them, the plankton and the ocean animals who depend on them, the moon's effect on

tides, or how coral reefs are formed. Have groups present their findings to the class.

4. **Evaluation.** Invite student partners or groups to make up multiple choice tests based on what they learned from *The Magic School Bus*, using the test at the end of that book as a model. Point out that, as in all good tests, the answer key says not only which answer is right, but also explains why the other answers aren't right. Invite test makers to administer their tests to other groups and discuss the answers.

EXTENDING THE SCIENCE

Activity 1. Suggest that students research and report on the technology for exploring the ocean and its depths. Sample topics might include the 1872 ship Challenger, the Nansen bottle, oceanographic diving, bathyspheres and bathyscaphs, and the NEMO, or Naval Experimental Manned Observatory.

Activity 2. Invite students to research the effects of oil spills and ocean mining on ocean life.

EXTENDING THE LITERATURE

Activity 1. Students can explore point of view in literature by writing a journal entry for one of the characters in *The Magic School Bus on the Ocean Floor*. For example, students might write a first person entry for Lenny the Lifeguard telling about his reaction to his amazing day with Ms. Frizzle and her class. Or students can take on the point of view of a shark, dolphin, or octopus, telling in the first person how the animal reacted to the sudden appearance in the ocean of a bunch of curious children.

Activity 2. Encourage students to write their own fantasy stories about adventure in the ocean or at the seashore. Suggest that the writers combine fact with their fantasy, using *The Magic School Bus* as a model. Collect students' journal entries and stories in a folder for your reading table.

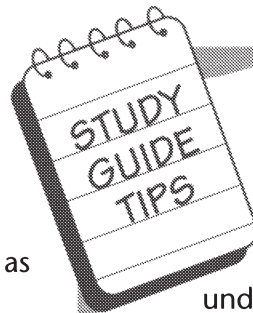
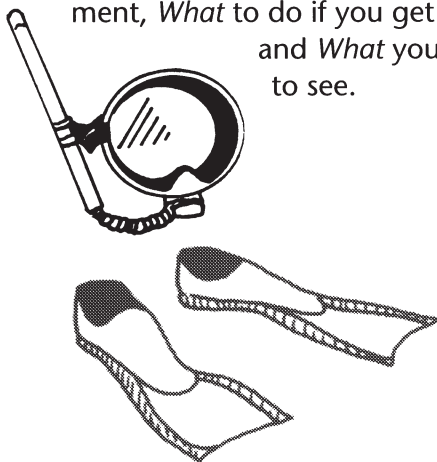
OTHER CONNECTIONS

ART: OCEAN SCULPTURE

Have students work in a group to make a tabletop, three-dimensional model of an ocean area. Use plywood as a base and plasticene (a nondrying clay that will hold water) as a liner. Continue using the plasticene to build ocean structures. Encourage students to choose an area of the South Pacific or the Caribbean to show in their model since these are the locales of the next books the class will read. Encourage your model makers to append as many labels and illustrative devices as possible to help viewers understand the model. Keep the model on display for as long as possible. It can be a great device for helping to retell the stories in the upcoming lessons.

HEALTH AND SAFETY IN THE WATER

After reviewing the fantasy elements that allowed Ms. Frizzles's students to go deep-sea diving, invite interested students to write and illustrate real-life safety brochures for people who want to snorkel or scuba. Students can find relevant material at shops that sell the equipment, at tourist and travel agencies, in books about the sports, in travel magazines, and in general encyclopedias. Help students develop categories under which to classify the information they find. Categories might include *Where* to do it, *When* to do it, *How* to check your equipment, *How* to use your equipment, *What* to do if you get into trouble, and *What* you might hope to see.



1. On the chart, encourage students to write brief notes rather than sentences. For example, under Intertidal Zone, students might write: *sand, rocks; covered by water at high tide; tidal pools at low tide*. Also remind students that they might have to show the pages in the book from which they got their information.
2. In response to questions 1 and 2 at the bottom of the page, students should check and circle all the plants and animals they've listed on their charts.
3. Answers to question 3 and 4 will vary.

The Magic School Bus on the Ocean Floor

Name: _____ Date: _____

DESCRIBING THE OCEAN

Geographical Area: What does it look like?	Plants that live there and how they get nourishment.	Animals that live there and what they eat.
Intertidal Zone:		
Continental Shelf:		
Deep Ocean Floor:		
Hot-Air Vents:		

Analyzing Your Chart

1. Check the items you've listed that depend on the sun.
2. Circle the items you've listed that are part of the food chain.
3. What is the next thing you'd like to learn about the ocean? Why? _____

4. How could you go about learning this? _____

LESSON

2

INTERDEPENDENCE OF LIVING THINGS

LITERATURE:

Coral Reef

Jane Burton and Barbara Taylor (Dorling, 1992)

SCIENCE UNDERSTANDING:

Ocean animals interact with one another in ways that promote their survival.

LITERARY GENRE:

Nonfiction science



BOOK SUMMARY

This volume, one in the *Look Closer* series, is outstanding for its organization, its incredible close-up photographs, and its lucid descriptions and examples of how each animal of a coral reef depends upon others. Its fact-packed presentation makes it a good research source for your science curriculum. In addition, the well-written, accurate prose gives students a model to aim for when they are writing about science or about any subject that requires detailed descriptions and explanations.

PRE-READING

1. Review the three student compositions on the pages in *The Magic School Bus on the Ocean Floor*, which tell how a coral reef is built, what coral polyps eat, and what the three main kinds of coral reefs are. Ask students to create a chalkboard list of further questions about coral reefs. Then show the cover and read the title and subtitle of *Coral Reef*. Some students may be able to identify the animals portrayed. Ask students to deduce why these animals are shown (they live in coral reefs), and explain that when they have finished reading the book,

students will be able to identify these animals and many more and to find answers to many of the questions they've listed.

2. Preview the book structure of *Coral Reef*. Show and discuss the table of contents and ask students to predict what animals the book sections tell about. Direct attention to the "Look for us . . ." caption and picture and discuss how realistic presentation of sizes is part of science. (Scientists aim for accuracy and clarity.) Have students skim the index and glossary. Discuss ways in which these are useful to a student of science.
3. Read to students the main copy on the opening pages, "Life on a Coral Reef." Explain that these pages preview each of the animals that will be treated in more depth in the pages that follow. Read two or three of the captions aloud. Explain that the Latin terms in parentheses are the common language of scientists when they are talking and writing about animals and plants.
4. Finally, have students compare and contrast the way information is presented in *Coral Reef* and *The Magic School Bus on the Ocean Floor*. The books are alike in that they use main text, colorful pictures, and captions.