Ocean Exploration and Research

The NOAA Ship *Okeanos Explorer* Education Materials Collection

For Grades 5 – 12

Volume 1:

Why Do We Explore?

National Oceanic and Atmospheric Administration
Office of Ocean Exploration and Research

November 2010
2nd Edition June 2012
3rd Edition August 2015

Project Manager: Paula Keener, Director, Education Programs
NOAA Office of Ocean Exploration and Research
Lesson Plan Development: Mel Goodwin, PhD, Marine Biologist and Science Writer, Charleston, SC
Design/Layout: Sandy Goodwin, Coastal Images Graphic Design, Mt Pleasant, SC
Reviewer: Susan Haynes, Education Program Manager, NOAA Office of Ocean Exploration and Research,
Contractor: Collabralink Technologies, Inc.

Cover photos courtesy National Oceanic and Atmospheric Administration (NOAA).

For more information, please contact:
Paula Keener, Director, Education Programs
NOAA Office of Ocean Exploration and Research
1315 East-West Highway
Silver Spring, MD 20910
Paula.Keener@noaa.gov

NOAA Ship *Okeanos Explorer:* America's Ship for Ocean Exploration. Image credit: NOAA. For more information, see the following Web site:
http://oceanexplorer.noaa.gov/okeanos/welcome.html

The NOAA Ship *Okeanos Explorer* Education Materials Collection

Table of Contents

Ocean Exploration and Research

Section 3:
Key Topic – Climate Change

Section 4:
Key Topic – Energy

Section 5:
Key Topic – Human Health

Section 6:
Key Topic – Ocean Health

Introduction

"The people who were putting up millions of dollars were asking my father, 'So, Captain, what do you expect to find?' and his answer to those people who were about to make major commitments was, 'If I knew, I wouldn't go.'"

Jean-Michel Cousteau, 2005

The wonders of the deep ocean and the mysteries of the universe. Inner Space and Outer Space. Both have historically and inextricably been linked with "exploration" and "discovery" since the beginning of humankind. For ages, people have gazed at planetary objects seemingly floating in the night sky and as early as 2,000 B.C., the Egyptians were exploring the seas. Astronomers and sailors–explorers driven by the human spirit of discovery and a fundamental need to know. What drives this quest for knowledge about the natural world, this fundamental need to know and understand what makes the planets move and the ocean change color?

Even as infants, humans are already exploring their world. In their book, *The Scientist in the Crib*, Gopnik *et al.* (2001) write "The tiny fingers and mouth are exploration devices that probe the alien world around them with more precision than any Mars rover. We are born with the ability to discover the secrets of the universe and of our own minds, and with the drive to explore and experiment until we do. Science isn't just the specialized province of a chilly elite; instead, it's continuous with the kind of learning every one of us does when we're very small." Can we capture and direct this innate need to know in novel ways to enhance science literacy?

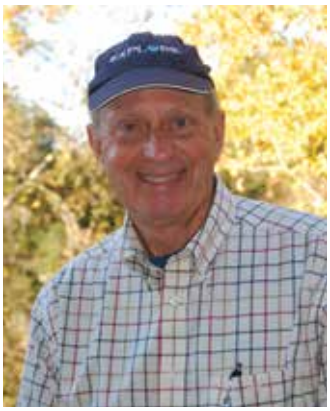
The President's Panel on Ocean Exploration fully recognized the importance of the connections among our fundamental need to know, ocean exploration, and science literacy when it called for "reaching out in new ways to learners of all ages with respect to ocean issues" (*Discovering Earth's Final Frontier: A U.S. Strategy for Ocean Exploration*, 2000). The President's Panel also had a vision of "a flagship for the Ocean Exploration Program…that would facilitate multidisciplinary data management and educational outreach by centralizing much of the data collection and outreach technologies on a dedicated platform through telepresence."

In 2008, the National Oceanic and Atmospheric Administration (NOAA) commissioned the NOAA Ship *Okeanos Explorer* as the first Federally-dedicated ship of exploration intended to carry out systematic global ocean exploration linked in real time through satellite and internet telepresence technology to scientists, educators, media and the general public. This ship offers an unprecedented opportunity to bring learners of all ages onboard for voyages to poorly-known or unexplored areas of the global ocean. Through the use of innovative technologies, they participate in explorations and breakthrough discoveries that lead to increased scientific understanding and enhanced literacy about our ocean world.

The **Why Do We Explore? Education Materials Collection** is part of a two-volume set that introduces the NOAA Ship *Okeanos Explorer* into formal and informal learning environments. The concept for this Collection was developed by participants during a two-day NOAA Ship *Okeanos Explorer* Education Forum held at the NOAA Pacific Marine Environmental Laboratory Western Regional Center Campus in Seattle immediately following the commissioning of the ship. The Forum focused on how best to reach students, teachers, and other audiences in novel ways with the excitement of ocean exploration given the unique combination of assets and capabilities brought to the NOAA Ocean Exploration and Research Program by the *Okeanos Explorer*.

The NOAA Ship *Okeanos Explorer* presents a unique national ocean-based venue through which to continue to implement the President's Panel recommendation of "reaching out in new ways to learners." It is our hope that these education materials, along with the ship and her telepresence capabilities bringing ocean exploration and new discoveries to scientists educators and their students, will have a profound effect on ocean literacy around the world as we, through our fundamental need to know, strive to understand our intrinsic connections with the ocean more fully and why it is called the "lifeblood of Earth."

Paula Keener, Director, Education Programs
NOAA Office of Ocean Exploration and Research



Using the *Okeanos Explorer* Education Materials Collection

An essential component of NOAA's Ocean Exploration and Research Program mission is to enhance understanding of science, technology, engineering, and mathematics used in exploring the ocean; and build interest in careers that support ocean-related work. To help fulfill this mission, the ***Okeanos Explorer* Education Materials Collection** was developed to encourage educators and students to become personally involved with the voyages and discoveries of the *Okeanos Explorer*—America's first Federal ship dedicated to ocean exploration. The **Education Materials Collection** is presented in three volumes: ***Volume 1: Why Do We Explore?*** (reasons for ocean exploration), ***Volume 2: How Do We Explore?*** (exploration methods), and ***Volume 3: What Do We Expect to Find?*** (recent discoveries that give us clues about what we may find in Earth's largely unknown ocean). In the future, additional guides will be added to the **Education Materials Collection** to support the involvement of citizen scientists.

Education materials for ***Volume 1 - Why Do We Explore?*** begin with a lesson titled *To Boldly Go…* to guide students through some of the reasons for ocean exploration; and to provide educators background information on key topics of Ocean Exploration, Climate Change, Energy, Human Health, and Ocean Health. The Diving Deeper section, starting on page 21, offers additional information on some aspects and the subsequent 15 lessons guide further investigations into these topics. Some of these lessons have been adapted from lessons previously developed for various NOAA Ocean Explorer expeditions, while others have been created specifically for the *Okeanos Explorer* education initiative. Whenever possible, hands-on activities are included that involve manipulations other than paper-and-pencil exercises or Web-based research. The reason for doing this is that field science, and exploration in particular, depend heavily upon technology and problem-solving skills needed to create, use, and advance new technology.

Lesson plans developed for Volume 1 are correlated with Ocean Literacy Essential Principles and Fundamental Concepts as indicated in the back of this book. Additionally, a separate online document (*http://oceanexplorer.noaa.gov/okeanos/edu/collection/wdwe_ngss.pdf*) illustrates individual lesson support for the Performance Expectations and three dimensions of the Next Generation Science Standards and associated Common Core State Standards for Mathematics and for English Language Arts & Literacy. This information is provided to educators as a context or point of departure for addressing particular standards and does not necessarily mean that any lesson fully develops a particular standard, principle or concept.

Lessons also include links to other relevant lesson plans from the NOAA Office of Ocean Exploration and Research, as well as the Ocean Explorer Web site (*http://oceanexplorer.noaa.gov/*). Educators who use the ***Okeanos Explorer* Education Materials Collection** should regularly check the Education Page on the *Okeanos Explorer* Web site (*http://oceanexplorer.noaa.gov/okeanos/edu/welcome.html*) for the latest information about new education offerings and professional development opportunities.

Welcome aboard!

Mel Goodwin, PhD
Marine Biologist and Science Writer

Notes: