

# BRINGING THE OCEAN TO THE CLASSROOM

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<http://oceanworld.tamu.edu>

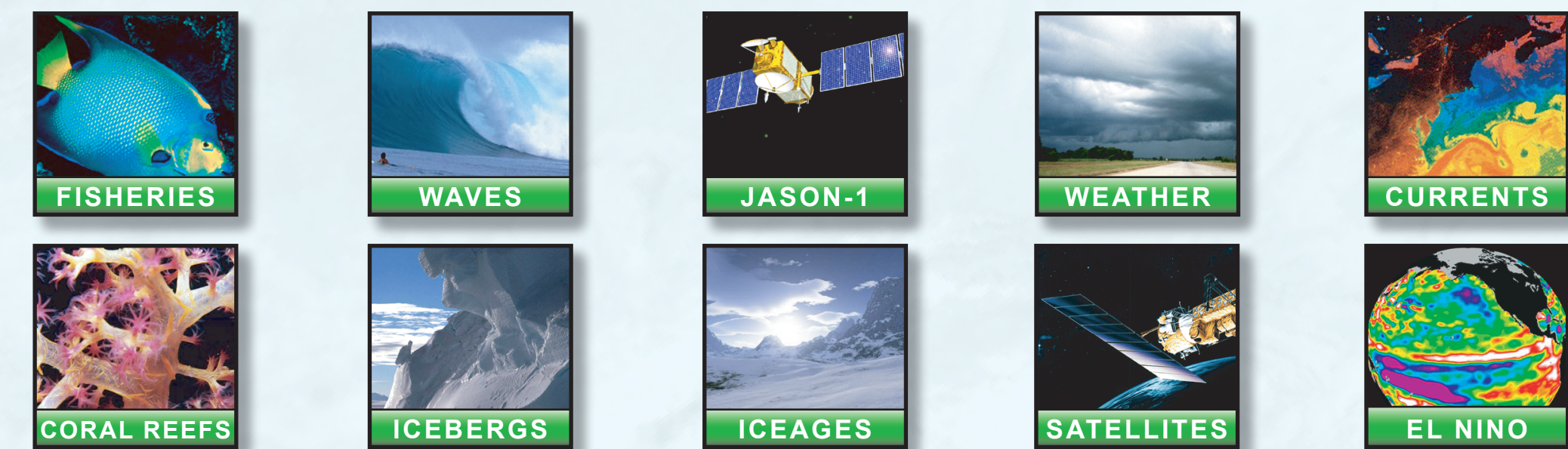
# oceanWorld

ELEMENTARY  
MIDDLE SCHOOLS  
HIGH SCHOOLS  
UNIVERSITIES



## STUDENTS

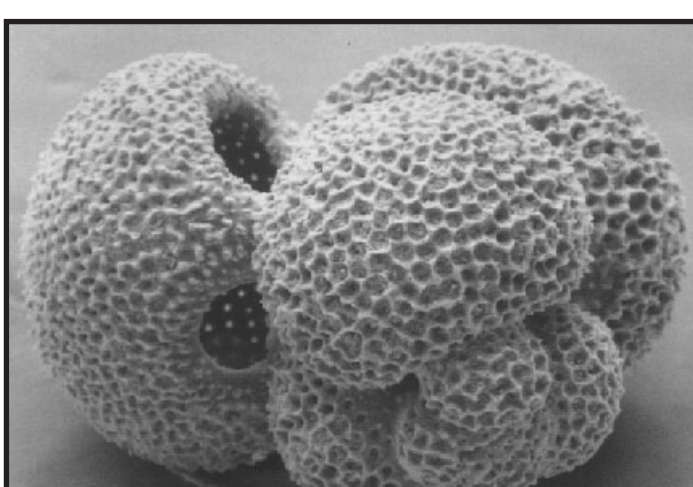
The Ocean World team has gone all over the web and the world gathering knowledge from smart scientists so we can now present you with the latest in oceanography information and topics.



Each topic section is organized so that you can find the information you need quickly and easily. Each section contains fast links to various points in the topic's pages, as well as pictures, an interactive quiz, real-time or near-time data links, and links to websites with further information.

### NEW FORAMS SECTION ADDED

Example content from FORAMS section

**FORAMS**  
**WHAT IS A FORAM**  
Foraminifera are single-celled organisms that have inhabited all types of marine environments for millions of years. Their survival is due in part to their ability to produce a protective outer shell, called a test. A test surrounds and protects them, and is composed of material that ranges from calcium carbonate to sand grains. Forams are categorized by their size and whether they are planktonic or benthic. The abundance, wide distribution, and sensitivity to their environment make these creatures unique and extremely helpful in studies of the oceans.  
  
Globobulimina ruber - fossil shell of a planktonic foraminifera. (Photo courtesy Christa Farmer of Columbia University)

FORAM SUB-TOPICS  
INCLUDE:

- ~WHAT IS A FORAM?
- ~BENTHIC VS. PLANKTONIC FORAMS
- ~FORAM EVOLUTION
- ~HISTORICAL CORRELATIONS
- ~WHAT CAN FORAMS TELL US?

### QUIZ YOURSELF ONLINE

A review quiz is available at the end of each section.


Example quiz from JASON-1 section

**JASON-1**  
**Introduction Online Quiz**  
Question 1. Jason-1 is named for:  
☐ 1. a famous astronaut.  
☐ 2. a hero of Greek mythology.  
☐ 3. the person who is paying for it.  
☐ 4. It's creator.  
Question 2. The Jason-1 satellite is equipped with some pretty sophisticated instruments. Which piece of the following equipment is not on Jason-1?  
☐ 1. a radiometer  
☐ 2. an altimeter  
☐ 3. a laser retroreflector array  
☐ 4. a scanning electron microscope  
Question 3. If the radiowaves sent out by the altimeter are gone for 40.03 seconds, how high is the altimeter?  
☐ 1. 4,500,000 meters  
☐ 2. 2,700,000 meters  
☐ 3. 9,500,000 meters  
☐ 4. 18,000,000 meters  
Question 4. What kind of images of Earth does the radiometer make?  
☐ 1. x-ray  
☐ 2. infrared  
☐ 3. solar  
☐ 4. Polaroid  
Question 5. Knowing the topography of the ocean helps people to do  
☐ 1. predict the weather  
☐ 2. fish more efficiently  
☐ 3. track sea bird migration  
☐ 4. find objects on the ocean floor  
Click the button below to evaluate your quiz.  
**Evaluate my quiz!**

### USEFUL LINKS for EACH STUDENT SECTION

Included are both real-time data and helpful links pages for each topic.

Example link from WEATHER section

**Role of the Ocean in Weather**  
**REAL TIME DATA SITES**  
  

Site Title
The Weather Channel
Site Producer
The Weather Channel
Synopsis
<a href="http://www.weather.com/">http://www.weather.com/</a> Come and visit this page! This creative page run by The Weather Channel shows maps of sea surface temperature and tropical storms for the Atlantic, Indian, and Pacific oceans. It also shows them for other places around the world.

## EDUCATORS

The newly reorganized EDUCATOR'S area of the website helps teachers easily develop educational activities coordinated with OCEAN WORLD and ocean science topics. This area now has three main sections: BACKGROUND INFORMATION, HOW-TO, and LESSON ACTIVITIES.

### BACKGROUND INFORMATION

Need quick background concepts to get up to speed on teaching oceanography? Our background information section contains detailed information on five oceanographic topics, each tied to the TEKS (Texas Essential Knowledge and Skills) and common themes. Provided for each topic are:  
☐ 1) Objectives  
☐ 2) Key Concepts  
☐ 3) Resources  
☐ 4) Classroom Activity

### OCEANOGRAPHIC TOPICS

**Topic: PROPERTIES of the OCEAN**  
This section deals with the physical properties of the ocean, their observation, measurement and interaction.

**Topic: FISHERIES**  
This section deals with fisheries, sea life, human impact on habitat, oceanic occurrences impacting sea life.

**Topic: OCEANIC HEAT BUDGET**  
This section deals with the concept of the heat budget, the water cycle, regional and seasonal change, the greenhouse effect.

**Topic: EL NINO**  
This section deals with El Niño, its causes, cycle, and impact.

**Topic: CURRENTS & OCEAN CIRCULATION**  
This section deals with the ocean currents, the processes which cause them, historical factors influencing them, and their impact on climate.

### HOW-TO SECTION

How do you use information from the world-wide web in your classroom? What if you only have one computer in the classroom? Find out an answer in this section. It provides an excellent source of how-to's and how-not-to's regarding setting up a classroom with widely varying levels of resources.

Example content from HOW-TO section

**TECHNOLOGY LAB STATION #1**  
**Teacher Introduction of Unit of Study and Group Discussions (Whole Group)**  
**Description:** At this station the teacher initially introduces the unit of study and provides the motivational elements to "hook" the students' interest. Students should be made aware of the types of activities that should take place at this and subsequent stations in an orientation session. Each time the student teams have completed a cycle of the stations, they will convene again as a whole group for questions, concerns, and such before the teacher introduces a new concept or facet of the unit under study. Sparking the student's interest and keeping them "focused on tasks yet to be completed" is an important part of this meeting.  
**Student Materials:** Journals or notebooks, textbooks (if any), and any necessary assignments for this station.  
**Station Equipment and Materials:**  
Low-tech - chalkboard/chalk or white board/markers  
Mid-tech - overhead projector and transparencies  
High-tech - computer with Power Point presentation  
**Activities:** Students learn through discussion. David Bridges, in his book Education, Democracy, and Discussion, explains that researchers have found five ways in which discussion builds understanding of a topic:  
1) Pooling information  
2) Sharing different perspectives  
3) Creating new conjectures  
4) Refutation  
5) The mutual adjustment of opinions  
**State Standards:** Listed here should be any state standards your state may require you to address at a particular grade level such as the Texas Essential Knowledge & Skills (TEKS) document.  
**National Standards and Benchmarks:** Listed here should be standards suggested by the aforementioned documents.  
**Assessment:** Completed assignments or journals/notebooks can serve as one type of assessment. Teacher evaluations of each student's participation in activities at this station can be used to assess the student's growth in the 5 areas mentioned from Bridges book.

### LESSON ACTIVITIES

These lesson activities are intended to be a starting off point to mold or change to fit your the needs of your class. Associated with each of the background information sections are five activities built on the common themes of:

- 1) Change
- 2) Energy
- 3) Systems and Structures
- 4) Interactions
- 5) Measurement

Example content from LESSON ACTIVITIES section


**Theme: Interactions**  
**Topic: PROPERTIES of the OCEAN**  
We have a drastic problem at hand and we are relying on you and your lab assistants to figure this one out!  
Captain Seamore thought it would be a good idea on this last leg of our research cruise to sail into the Gulf of Mexico to the mouth of the Mississippi River. Since our ocean-going research vessel draws this is how much of the ship is under water when it's sailing on the sea! only 5 meters of water he wanted to try and go up the Mississippi River a short distance and do some data gathering.  
Navigation charts of the Mississippi indicate that the river is deep enough to accommodate our ship. Some parts of the river, however, are only 5 meters deep. Those areas will be a tight fit.  
**Problem**  
As we approached the mouth of the Mississippi and attempted to enter, we found we didn't fit. Our ship was drawing more than 5 meters of water. As we sailed back to the Gulf and toward the open ocean, our ship was only drawing 5 meters of water. Again we attempted the Mississippi and again, our ship drew more than 5 meters of water. In other words, we were sitting lower in the water and couldn't get to where we wanted to go in the Mississippi. WHAT IS HAPPENING HERE?  
**Mission**  
Your assignment should you choose to accept it, will require that you: build a hydrometer—a device that allows you to compare the densities of different liquids (not just water) and use your hydrometer to track the addition of salts to alter density of water.  
**Assessment**  
You will be assessed on your constructed hydrometer, completed data table, and your answers to the questions below.  
**What is an estuary?**  
What happens where rivers meet the sea?  
Which factors affect the density of ocean water?  
What is the draft of the boat in fresh water if it is 5 meters in salt water (you may have to use your math here)?


## RESOURCES


Here you will find a wealth of ocean-related references, from suggested readings to entire web sites. This is a "must-visit" part of Ocean World.

### FOUR STAR SITES

After looking at many educational sites and challenging them against our criteria, we have come up with a top list of sites. Examples include:

  
Athena is full of lesson plans and teaching materials for grades K-12 on space, Earth, oceans, and weather. Also contains wonderful teacher information on using the Web and incorporating it into the classroom.  
<http://vathena.arc.nasa.gov>

  
Bill Nye, the Science Guy, is stocked with daily experiments and teaching materials. This site focuses on various topics in life, physical and planetary sciences. Also, past aired shows are indexed based on science area covered.  
<http://www.nyelabs.org>

  
The Discovery Channel School has seasonal themes, which offer a variety of teaching resources for many subject areas. Each theme comes equipped with an overview, list of programs, complete classroom activities online links, discussion forum, and related catalog products.  
<http://school.discovery.com>

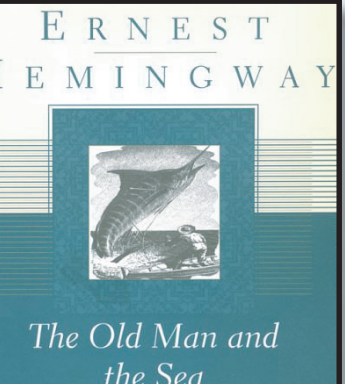
### IMPORTANT LINKS

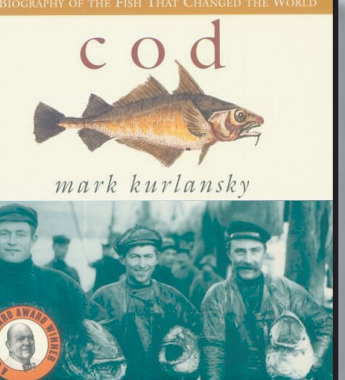
A list of important sites addressing a number of topics which we wanted to include for your reference. Various categories include:

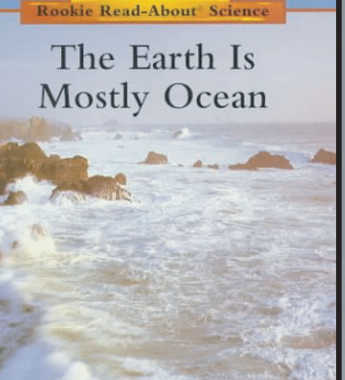
- ☐ ~ Online Museums
- ☐ ~ Teacher Resource Links
- ☐ ~ Professional Organizations
- ☐ ~ Government Agencies
- ☐ ~ Standards
- ☐ ~ World Wide Web Tutorials and History for Classroom Use

### BOOK GALLEY

Looking for books, fiction and non-fiction, on Oceanography? Here are some of our favorites. Often young and old alike get "turned on" to a topic like the ocean by reading literature that stirs their imagination. There is much yet to be explored about the ocean, so imagination still plays an important role. Take the time to "get lost" in a good book, like:

  
**The Old Man and the Sea by Ernest Hemingway**  
This is a novel in the purest sense. It would be classified as realistic fiction because it is believable. In other words, something like it could realistically happen. The old Cuban fisherman, Santiago, has not been successful fishing the Gulf Stream in his little skiff. The men of the village laugh at him. His dream of catching the "big one" seems to be just that—a dream. Thin, gaunt, and heavily wrinkled the old man has only the young boy who listens and believes. The ordeal of a lifetime awaits Santiago as he sets out to find the big one far out in the Gulf Stream.

  
**Cod: The Biography of the Fish That Changed the World by M. Kurlansky**  
Why did the Pilgrims starve when the world's most productive fishery was just yards offshore? The fishery had been so lucrative that the area was named Cape Cod in 1603, 17 years before the Pilgrims arrived. How did Cod influence world history? What happened to the fishery that was thought to be so great that it could never be overfished? Here is a small book, suitable for high school students, that combines marine and fishery science, history, economics, and interesting recipes in a remarkable book about a remarkable fish.

  
**The Earth is Mostly Ocean by Allen Fowler**  
This is a great book for young readers. It gives an introduction to some of the world's oceans, informs children about high and low tides, and talks about what the Mariana Trench is. This book also touches on the jobs of oceanographers and at the end gives a review section where children can quiz themselves on the facts they learned from *The World is Mostly Ocean*.

### MUCH MORE TO EXPLORE

Other sections in the RESOURCES part of the OCEAN WORLD website include:

- ☐ ~OCEANOGRAPHY
- ☐ ~A GLOSSARY
- ☐ ~BOOKMARKS
- ☐ ~AN ONLINE ATLAS

## COLLEGE


OCEAN WORLD is not just for educators and young students. Research tools are available for those who wish to study oceanography more in depth. Other than the links in the RESOURCE section, sources available on the website for these "seekers of knowledge" are listed below.

### PHYSICAL OCEANOGRAPHY TEXT BOOK

AVAILABLE ONLINE and for DOWNLOAD

This is a new textbook describing physical-oceanographic processes, theories, data, and measurements. In addition to the classical topics, included are discussions of heat fluxes, the role of the ocean in climate, the deep circulation, equatorial processes including El Niño, data bases used by oceanographers, the role of satellites and data from space, ship-based measurements, and the importance of vorticity in understanding oceanic flows. This text has been used to teach upper-division undergraduates and graduate students in oceanography, meteorology, and ocean engineering.

Introduction to  
**PHYSICAL OCEANOGRAPHY**




Robert H Stewart

**Contents**  
Ch 1 - A Voyage of Discovery  
Ch 2 - Historical Setting  
Ch 3 - The Physical Setting  
Ch 4 - Atmospheric Influences  
Ch 5 - The Oceanic Heat Budget  
Ch 6 - Temperature, Salinity, and Density  
Ch 7 - The Equations of Motion  
Ch 8 - Equations of Motion With  
☐ Viscosity  
Ch 9 - Response of the Upper Ocean to  
☐ Winds  
Ch 10 - Geostrophic Currents  
Ch 11 - Wind Driven Ocean Circulation  
Ch 12 - Vorticity in the Ocean  
Ch 13 - Deep Circulation in the Ocean  
Ch 14 - Equatorial Processes  
Ch 15 - Numerical Models  
Ch 16 - Ocean waves  
Ch 17 - Coastal Processes and Tides

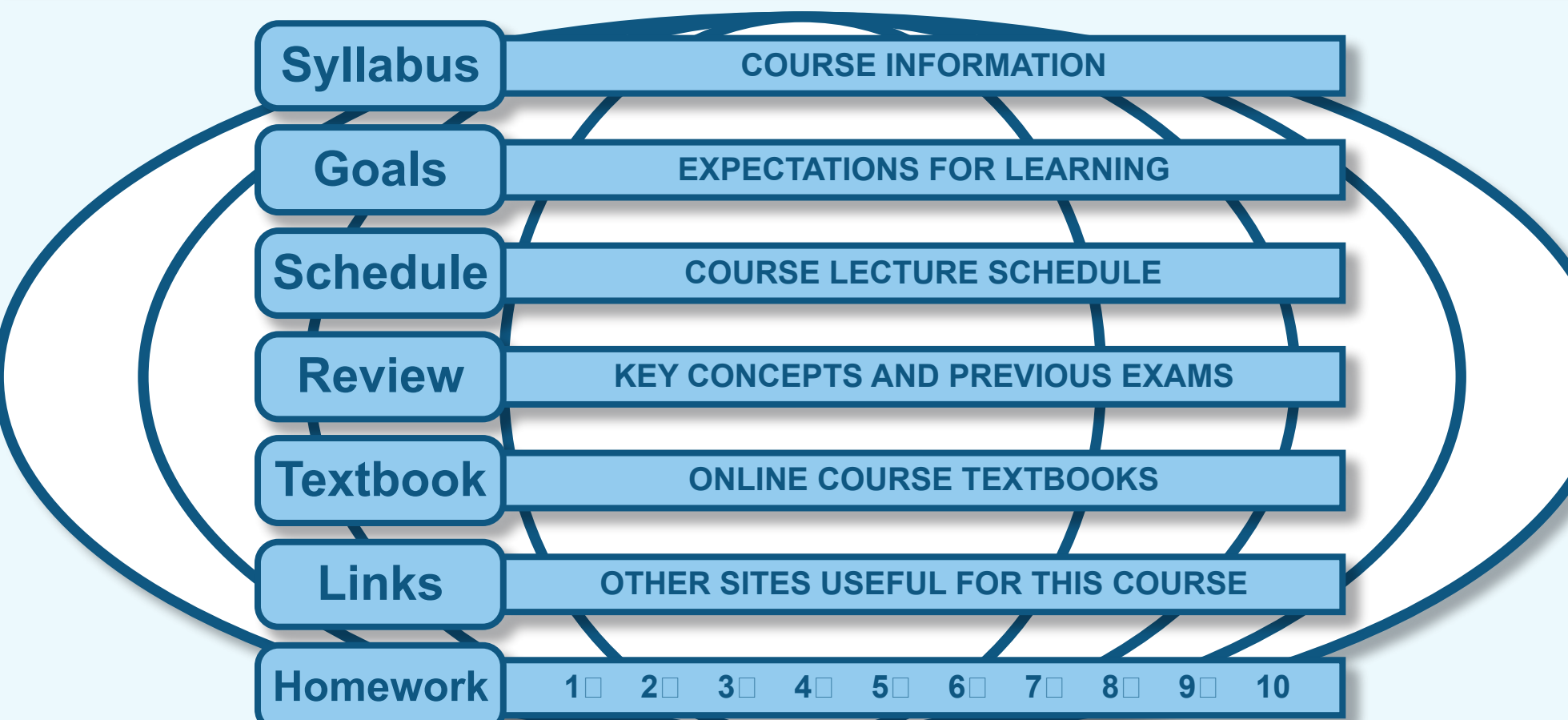
### COLLEGE COURSES ONLINE

Dr. Bob Stewart currently teaches 3 undergraduate and graduate level oceanography courses at Texas A&M University. Linked in the Ocean World website, these class websites are available to students enrolled in the classes, as well as the general public.


Among the resources contained in these sites below are full course notes, suggested links, homework assignments, and for the graduate class, complete lectures in MP3 format audio.

**OCNG 401**  
  
Introduction to Oceanography

**Dr Robert Stewart**



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