

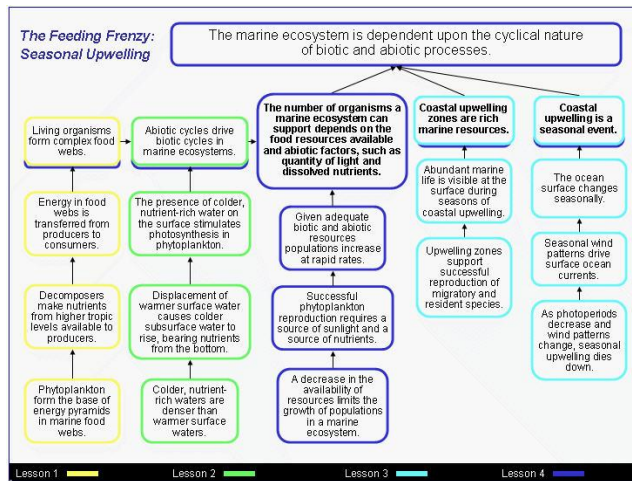
**What are Teaching Boxes?**

Teaching boxes are classroom-ready instructional units created by collaboration between teachers, scientists, educators, and designers.

- Free and online – All educators may use DLESE Teaching Boxes free of charge
- 3 – 6 weeks of classroom instruction
- Science concepts that are inter-related, age-appropriate, and lead students to a broader understanding of a topic
- Inquiry-based learning
- Earth system science focus, e.g. sea level change

**Concepts: The foundation for each Box**

A conceptual framework underpins each box to encourage a broader understanding of the content presented in each lesson. Each concept map shows the key scientific concepts that students should understand as a result of conducting the investigation.



The box relates concepts to corresponding national and state education standards in science, math, and language arts and directs the user to the lessons that teach them.

**Lessons: The work of experts**

Experienced teachers and scientists collaborate to ensure not only accuracy, but that the activities in lessons are sequenced appropriately and address the concepts. Lessons have *bang and flair* to help drive home the concepts and have excellent

instructions for new or experienced classroom teachers. Activities can be completed in one class period, and are easy to use.

The classroom activities used in the Teaching Boxes can be found among the respected online resources selected for inclusion in the *Digital Library for Earth System Education* ([www.dlese.org](http://www.dlese.org)).



**Evidence-based Investigations: A focus on inquiry**

Each box engages students in the process of science – focusing on gathering and analyzing evidence. Each Teaching Box contains materials that model scientific inquiry, allowing teachers to build classroom experiences around data collection and analysis from multiple lines of evidence.

The sequence contains ideas for in-class activities, suggestions for homework, and ways to extend the lessons for advanced learners. Assessments and rubrics help determine student understanding.

**Teaching Box Features**

- Conceptual framework
- National and state science, math, and language arts standards
- Selected and reviewed digital library resources
- Inquiry-oriented lesson plans
- Learner assessments
- Culminating activities to assess learning



Visit [www.teachingboxes.org](http://www.teachingboxes.org) for these currently available teaching boxes:

### **Evidence for Plate Tectonics**

The teaching sequence in this Box emphasizes the process of science – how evidence is gathered and hypotheses tested. Through guided inquiry students discover scientific evidence that has led to our understanding of plate tectonics. Activities demonstrate the inter-relatedness of Earth’s processes and lines of evidence, reinforcing the overarching concept of the Earth as a system.

### **Essentials of Weather**

In this Teaching Box students explore basic elements, forces and processes involved in weather - temperature, pressure, density, convection, differential heating, and condensation, and how these elements combine to create the dynamics of weather. This Box provides an inquiry-based exploration of winds, clouds, and extreme weather events.

### **Feeding Frenzy: Seasonal Upwelling**

The goal of this Teaching Box is to teach students about the biotic and abiotic factors that drive process of upwelling. Students will deepen their understanding of the dynamics that create a seasonal abundance of marine life in coastal upwelling zones. In the process they discover that wind-driven upwelling supplies phytoplankton in the upper ocean with nutrients from deep ocean waters.

### **Global Ups and Downs: Changing Sea Level**

This Box focuses on the concept that changes in sea level have occurred in the past, are occurring now, and will continue to occur. The Box provides an inquiry-based exploration of four lines of evidence for periodic melting of ice and resulting sea level rise: glacial, geologic, fossil, and isotopic.

### **Living in Earthquake Country**

This Box focuses on teaching students about how and why earthquakes cause damage. It explores seismic waves, the ability of scientists to predict the likelihood and severity of earthquakes at specific locations, the difference between magnitude and intensity, the occurrence of earthquakes along patches of planar faults, and the damage caused by earthquakes.

### **Mountain Building**

Mountain Building focuses on the concept that mountains are the result of past processes and events. Students use clues from the shape, composition, and location of the mountains to discern mountain history. They explore the lines of evidence that scientists use to investigate how mountains form and why they appear they way they do. Students use the knowledge gained to provide captions for a series of mountains in a photographic journal.

### **Building Teaching Boxes: A Unique Professional Development Opportunity**

Through the development workshops, teachers gain:

- Exposure to current research and scientific thinking
- Experience with inquiry-based learning
- Opportunity to design, develop and share conceptual frameworks, lesson plans and other teaching resources
- University credit to satisfy NCLB requirements.

Tools and plans to facilitate developing and sharing new Boxes and to customize existing ones are in development.

### **The Teaching Boxes Team**

- DLESE Program Center, UCAR
- University of California Museum of Paleontology
- University of Colorado, Boulder
- US Geological Survey, Menlo Park
- Teachers from the San Francisco Bay Area
- Funding provided by the National Science Foundation