EarthLabs is a model Earth science lab course for high school students. The lab experiences feature a combination of classroom experiments and computer access to data and visualizations, and demonstrate the rigor and depth of a true lab course. This effort aims to create a set of exemplary lab modules that span several days or more, engage students in deep and long-lasting investigations, enable them to explore the rich interconnections in the Earth system, and involve a variety of inquiry-based experiences.

NOAA initiated work on the EarthLabs course by funding four prototype units focused on the domains of oceans and the atmosphere and their connections with other components of the Earth system. These topics were selected because they represent rich domains of current research of interest to NOAA and the other partners.

On the web, EarthLabs is composed of two sites, one for educators or policy makers and the other for students. This strategy provides teachers with the support they need without overwhelming the students with all this additional information. The students get pages that lead them through the activities which they need to complete. To avoid potential confusion for instructors, we’ve given the different pages distinct characteristics and labeling. There are also links from the Educator’s Page to the Student’s Page but not in the other direction.

Hands-On Labs

Laboratory experiments are an important component of science education. EarthLabs provides hands-on activities that are designed to engage students in the scientific process of inquiry. These activities are intended to help students develop a deeper understanding of the concepts being studied and to foster critical thinking skills.

Teacher’s Website

On the Teacher’s Website, educators will find:

- **Lab Overviews**: Detailed descriptions of each lab, including objectives, materials, and procedures.
- **Teaching Notes and Tips**: Additional guidance for teachers on how to deliver the labs effectively.
- **Formative and Summative Questions**: Questions to assess student understanding.
- **Context for Use**: Information about how the labs fit into the broader curriculum.
- **Background Information**: Additional background information for teachers.
- **Applicable State and National Standards**: Links to state and national standards relevant to the labs.

Student’s Website

On the Student’s Website, students will find:

- **Readings**: Relevant readings and articles to supplement the lab activities.
- **Videos**: Educational videos that demonstrate key concepts.
- **Visualizations**: Interactive visualizations to help students visualize data.
- **Formative and Summative Questions**: Questions to assess student understanding.
- **Hands-On Labs**: Interactive labs where students can engage in hands-on activities.

**RELATED RESOURCES**

- [Hurricane Visualizations](http://serc.carleton.edu/NAGTWorkshops/visualization/collections/hurricane.html)
- [Teaching Biocomplexity](http://serc.carleton.edu/introgeo/earthsystem/index.html)
- [Using Data in the Classroom](http://serc.carleton.edu/usingdata/index.html)

The labs in each chapter are Integrated Instructional Units, as described in America’s Lab Report (NRC, 2006):

- **Learner Centered**
- **Knowledge Centered**
- **Assessment Supports Learning**
- **Community Centered**

Four Prototype Chapters

Focused on Ocean and Atmosphere issues and the connections between them and the rest of the Earth System.

- **Lab 1: Exploring Factors that Impact Coral Health**
- **Lab 2: Understanding the Ocean Currents**
- **Lab 3: Investigating the Ocean and Atmosphere Connections**
- **Lab 4: Exploring the Role of the Atmosphere**

Lab 5: Exploring Factors that Impact Coral Health

- **Objective**: To investigate the factors that impact coral health.
- **Materials**: Paper, pencil, calculator, and access to the internet.
- **Procedure**: Students will conduct a series of experiments to determine the effects of temperature, pH, and light on coral health.
- **Assessment**: Students will be expected to complete a lab report and a short quiz to demonstrate their understanding of the concepts.

Nitrate and Phosphorus and Algae, Oh My!

- **Objective**: To explore the relationship between nitrate and phosphorus levels and the growth of algae in aquatic ecosystems.
- **Materials**: Test tubes, beakers, water samples, and access to the internet.
- **Procedure**: Students will conduct experiments to measure nitrate and phosphorus levels in different samples of water.
- **Assessment**: Students will be expected to complete a lab report and a short quiz to demonstrate their understanding of the concepts.

Aligning with state and national standards:

Each lesson has a list of relevant science education standards from the states involved as well as from the National Science Education Standards. These include:

- **State Standards**: Links to specific state standards relevant to the labs.
- **National Standards**: Links to the National Science Education Standards.

All the units have labs where students do something to learn about the topic.