

## Course Syllabus

### Title

Introduction to the Earth System

### Target Audience

This course is intended for pre-service and in-service teachers of earth and space sciences in grades 5-12.

### Prerequisites

To successfully participate and complete the assignments in this course, the learner must:

- Be familiar with taking an online course or have completed the PBS “Practice Learning Online with TeacherLine” course.
- Have some experience in grades K-12 classrooms.
- Have an interest in Earth and space sciences.

### Course Description

This course focuses on three elements: content knowledge, inquiry and other teaching strategies, and use of multimedia and visualization tools in teaching and learning about the earth system. Teaching Earth and Space Science is designed to enhance educators' understanding and teaching of earth and space science. The course explores the principles of constructivist learning and exploration-based science and works through content and methodology to give teachers a comprehensive understanding of earth and space science to encourage the learning success of students. Through the readings, videos, discussions, assignments, and other interactive experiences, learners in this course will have multiple opportunities to develop content knowledge about energy transfer and earth system cycles and inquiry into earth system science. Learners will experience a rich multimedia, inquiry-based learning environment as their students ideally would in their own classrooms. The course provides effective teaching methodologies, strategies and tools that can be used when teaching earth and space concepts.

### Instructor/Facilitator

See instructor/facilitator sheet.

### Credits

To be determined by college or university.

### Course Goals

As a result of participating in this course learners will:

- Develop content knowledge about Earth as a system;
- Introduce inquiry-based learning models;
- Introduce a media-rich learning environment to use with students; and
- Understand and utilize the scientific process.

### Outline of Content and Assignments

Learners in this course are expected to participate in discussions and complete assignments. Learners are also expected to keep a personal notebook (which is not assessed) to keep notes, complete exercises and record reflections about their learning experiences in this course.

### Discussion Activities

- **Essential Question** – Each session includes a discussion about an essential question and teaching and learning issues related to this question. Learners post responses to questions posed in the course and respond to posts submitted by their colleagues.

**Assignments** - Learners are expected to submit assignments. Rubrics are provided for assessment of all assignments, and the course content includes assignment samples.

Assignments in this course include:

- **Writing Assignments** - Short writing assignments (essays) are submitted to the facilitator.

### **Required Readings**

- Session 1:
  - "Excerpt from Earth System Science: A Closer View"
  - "Annotating a Study Site Photograph"
  - "The Earth System on Different Spatial Scales"
  - "Introduction to Earth System Science"
  - "Diagramming Earth as a System"
- Session 2:
  - "Inquiry in Science and in Classrooms"
  - "Learning Through Inquiry and its Implications for Teaching"
  - "Essential Features of Inquiry (Annotated)"

## **SESSION 1: ENERGY TRANSFER AND EARTH SYSTEM CYCLES**

**Objectives** - After completing this session, learners will be able to:

- Show that Earth events taking place within the global environment are interconnected, and that these connections create interdependencies at many levels and scales.
- Describe how radiation, conduction, advection, and convection transfer energy through the Earth system.
- Explain how the atmosphere, hydrosphere, lithosphere, and biosphere interact and are responsible for the characteristics of Earth's physical features and environmental conditions.
- Outline the water cycle and carbon cycle and describe their role in integrating atmosphere, hydrosphere, lithosphere, and biosphere processes.

Using an inquiry-based approach, the session is divided into the following sections: Invitation, Exploration, Explanation, Application and Putting It into Practice. The **Essential Question** for this session is: ***What is the Earth system, and how does it function to create the physical world around us?***

Activities in this session delve into what it means to look at Earth as a system. This session also introduces learners to the online course and to the experience of being a student again as they work out a common understanding of the Earth system perspective.

Assignments in this session require learners to demonstrate an understanding of the effects of changes within the Earth system and to use Earth system science terminology correctly. Learners also revise a lesson plan using the systems approach and the resources and concepts from the session.

Discussions in this session focus on finding solutions for the essential question for this session.

Learners will record notes and reflections in their personal notebook about different concepts, methods, activities and ideas presented throughout the session.

## **SESSION 2: INQUIRY INTO THE EARTH SYSTEM**

**Objectives** - After completing this session, learners will be able to:

- Describe the essential elements of inquiry in the science classroom.

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- Explain key findings from research about learning and apply them in the classroom.
- Discuss how an instructional model that sequences learning experiences can help students build a deeper understanding of important Earth system science concepts.
- Understand that scientists use quantitative, qualitative, experimental, and non-experimental methods of scientific inquiry to understand Earth.
- Understand that knowledge in the Earth system science, as in all scientific disciplines, is subject to revision.
- Develop strategies for improving one of their current lessons to increase the level of inquiry and to reflect understandings about how people learn.

Using inquiry-based approach, the session is divided into the following sections: Invitation, Exploration, Explanation, Application and Putting It into Practice. The **Essential Question** for this session is: ***How can the nature and sequence of learning opportunities improve students' understanding of Earth system science?***

Activities in this session delve into the use of an inquiry-based approach in an Earth system science classroom, and learners reflect on the role of inquiry-based activities in their own current classroom practices.

Assignments in this session require learners to analyze how an Earth systems topic embodies an inquiry approach to learning and to determine how lessons may incorporate the 5E learning sequence. Learners also revise a lesson on Earth systems to incorporate the resources and concepts from the course.

Discussions in this session focus on finding solutions for the essential question for this session.

Learners will record notes and reflections in their personal notebook about different concepts, methods, activities and ideas presented throughout the session.

### **Schedule**

This course is scheduled to take approximately 30 hours to complete.

### **Requirements**

Learners are expected to:

- Complete all assignments.
- Participate and actively engage in discussions with fellow learners while contributing to the social construction of knowledge.
- Be self-directed and self-motivated.
- Ask for assistance when they need it.

Facilitators are expected to:

- Provide feedback to all learners.
- Participate in discussions to keep them moving forward.
- Provide assistance to learners who need it.

### **Technical Requirements**

- Word Processor
- Internet service provider
- E-mail
- Shockwave and Flash: <http://www.macromedia.com/downloads/>
- Acrobat Reader: <http://www.adobe.com/products/acrobat/readstep.html>
- QuickTime: <http://www.apple.com/quicktime/download/>

**Standards of Academic Integrity**

As posted on PBS TeacherLine Web site at

[http://teacherline.pbs.org/teacherline/help/help\\_template3.cfm?subID=197](http://teacherline.pbs.org/teacherline/help/help_template3.cfm?subID=197)

**Evaluation**

This course is evaluated on a letter grade basis, and graduate credit may be available. See the PBS TeacherLine Web site for details pertaining to specific graduate credit instructions.