

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 6-12.

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 life, 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. *Introduction to the Earth System* explores the essential questions of what is the Earth system, how does it function to create the physical world around us, and how can the nature and sequence of learning opportunities improve students’ understanding of Earth.

Through the readings, videos, discussions, assignments, and other interactive experiences, learners in this course will have multiple opportunities to develop content knowledge about Earth system cycles, energy transfer, and proper 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 science 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;
- understand the use of inquiry-based learning models;
- become familiar with 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 - The course provides frequent opportunities for learners to discuss the content topics of the sessions as well as teaching and learning issues. Learners post responses to questions posed in the course (or other thoughts you may have) and respond to posts submitted by their colleagues.

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

Required Readings

- "Earth System Science: A Closer View "
- "The Earth System on Different Spatial Scales"
- "Introduction to Earth System Science"
- "Diagramming Earth as a System"
- "Inquiry in Science and in Classrooms"
- "Learning through Inquiry and its Implications for Teaching"
- "Earth Systems Science Misconceptions"

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; and
- outline the water cycle and carbon cycle and describe their role in integrating atmosphere, hydrosphere, lithosphere, and biosphere processes.

Using inquiry-based approach, the session is divided into the following sections: Invitation, Exploration, Explanation, Application and Putting It on 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 will delve into the meaning of looking at Earth as a system. Learners will record notes and reflections in their personal notebook about different concepts, methods, activities and ideas presented throughout the session.

Session Structure and Activities

Invitation

Topic: A New Perspective on Earth, The Earth System Perspective

Video: There's No Place Like Earth, Connecting the Lithosphere and the Biosphere,

Readings: "Earth System Science: A Closer View"

Exploration

Topics: What Are the Parts of the Earth System, What Moves Energy, Why Is the Water Cycle Important, Why Are Biogeochemical Cycles Important?

Video: Hurricane Katrina: Wetland Destruction, Earth as a System, Water Vapor Circulation on Earth, Ingredients for Life: Carbon

Interactives: Examine Global Surface Currents, The Hydrologic Cycle, Carbo the Carbon Atom

Images: Earth's Energy Budget, Carbon Cycle Diagram

Explanation

Topics: Effects of Changes Within the Earth System, How Do the Water and Carbon Cycles Interact in Cave Formation, Linking Ideas Back to Your Own Community



Video: An Everglades Visit, How Caves Form, Virtual Cave, Cave Formation: Biogeochemical Cycles

Readings: “The Earth System on Different Spatial Scales”, “Introduction to the Earth System Science”

Assignment #: 1

Application

Topics: Using the Earth System Approach to Examine Global Change, Earth System Analysis

Video: Earth System: Drought and Air Quality

Putting It into Practice

Topics: Analyzing Photos of Earth Systems, Using the Systems Approach

Readings: “Diagramming Earth as a System”

Assignment #: 2

SESSION 2: Inquiry into Earth System Science

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

- describe the essential elements of inquiry in the science classroom;
- 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; and
- develop strategies for improving one of your 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 on 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 will delve into the use of an inquiry-based approach in an Earth system science classroom. Learners will record notes and reflections in their personal notebook about different concepts, methods, activities and ideas presented throughout the session.

Session Structure and Activities

Invitation

Topic: Inquiry and Earth System Science

Exploration

Topics: Inquiry in Science and in Science Classrooms, Scientists at Work, The Scientific Process

Video: Galileo’s Big Mistake, Plate Tectonics: The Scientist Behind the Theory, Hubble’s Expanding Universe

Readings: “Inquiry in Science and in Classrooms”

Explanation

Topics: What Does Inquiry Really Mean?, The 5E Instructional Model, Learners and Learning

Video: What is the Greenhouse Effect?

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Readings: "Learning through Inquiry and its Implications for Teaching"

Assignment #: 1

Application

Topics: Identifying Prior Knowledge and Misconceptions, Using Inquiry to Build Systems Thinking Skills

Readings: "Earth Systems Science Misconceptions", "Diagramming Earth as a System"

Interactives: The Hydrologic Cycle

Putting It into Practice

Topics: Students and "Doing Science", Analyzing Inquiry in the Classroom, Final Assignment: Analyzing a Lesson

Video: Solar Still Part I: Water, Inquiry-Based Teaching

Assignment #: 2, 3

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

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.