

Title

Weather and Climate

Target Audience

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

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. Course goals include:

- developing content knowledge about Earth's history, the Sun-Earth-Moon system, and broad temporal and spatial scales;
- following inquiry-based learning models;
- introducing a media-rich learning environment to use with students; and
- providing effective teaching methodologies, strategies, and tools for use in teaching earth and space science concepts.

Instructor/Facilitator

See instructor/facilitator sheet.

Credits

To be determined by college or university.

Course Goals/Objectives

As a result of participating in this course students will:

- explain effects of pressure, temperature, moisture (including humidity, dew point, and precipitation), wind, and stability on daily weather;
- identify major weather elements -- such as a cold front -- in time-series data and spatial data on a map;
- describe both horizontal and vertical motions associated with mid-latitude weather systems;
- explain why technological advances -- such as satellite remote sensing -- permit us to map and monitor changes in daily weather patterns;
- explain how radiant energy from the Sun creates temperature differences in water, land, and atmosphere -- which drive local, regional, and global patterns of atmospheric circulation;
- describe how density differences in ocean water are responsible for ocean circulation; and explain the meaning and causes of the greenhouse effect and global warming.

Student Evaluation Process:

1. Notebook Entries

The notebook is an offline record of notes that participants take throughout the course.

2. Discussion Forum:

- **Topical Discussions and Teaching and Learning Discussions** - Each session includes a discussion about the topic of the session and others about related teaching and learning issues. Learners post response to questions posed in the course (or other thoughts you may have) and respond to posts submitted by their colleagues.
- **Final Assignment Discussion**

Each session also includes a link to an ongoing discussion concerning final assignment preparation.

3. Assignments:

The dropbox is the area on the course Web site that learners will use to submit assignments and/or discuss them online with their facilitator. Assignment prompts in the course content include assignment samples and a tool to compare answers. Assignment rubrics are provided for assessment of all assignments. Assignments in this course include:

- **Questions:** Compare Your Answer
Learner's written responses to a question are compared to answers written by experts in the field.
- **Writing Assignments**
Short writing assignments are submitted to the facilitator using the dropbox.
- **Final Course Assignment**
For the final curriculum design project for this course, learners will develop a set of three activities on one or more life science topics for students at your grade level. The activities may form one coherent lesson or may be usable as parts of several lessons on different topics. Learners will base the activities on their experiences with content and methodology in this course. The activities should be grade-appropriate and should reflect mandated teaching standards for their district or state. For each activity, learners should identify objectives for student understanding of the relevant topic and suggest assessments to determine whether the activity has helped students meet those objectives.

Texts (required readings):

This course was produced in collaboration with the University Corporation for Atmospheric Research (UCAR) and the Digital Library for Earth System Education (DLESE). Learning objectives for course sessions are based in part on the work of Earth Science by Design, a project of TERC and the American Geological Institute.

- Multimedia resources including interactives, images, videos covering related science topics in each session.
- Specific Assigned Readings
 - "Data and graphics furnished by the University Corporation for Atmospheric Research and the Carbon Dioxide Information Analysis Center"
 - "Greenhouse Effect in the Classroom"
 - "The GLOBE Program Teacher's Guide"
 - "Great Ocean Conveyor Belt Background Essay"
- Specific videos and interactives are indicated at point-of-use in the session descriptions.

Sessions: *(topic and content, instruction, readings, assignments, etc. for each class meeting)*

Two sessions cover key content and methodologies for teaching weather and climate.

SESSION 1: WEATHER

Session Structure w/ topics, delivery method, and specific videos and readings

Invitation

Topic: **Weather Forecasting**

- Notebook
- Video
 - Kid Meteorologist
- Discussion

Exploration



- Topic: Observing the Weather
 - Video
 - Observe Water in Winter and Summer
 - Notebook
 - Discussion
- Topic: Surface Air Temperature
 - Review Graph
 - Notebook
 - Discussion
- Topic: Air Pressure and Wind
 - Review Graphs
 - Discussion
- Topic: High and Low Pressure Systems
 - Surface and Vertical Air Motion simulations
- Topic: Moisture Stability
 - Videos
 - Observe Clouds
 - Cloud Types
 - Notebook
 - Discussion
 - Interactive
 - NOAA Geostationary Satellite Server
 - Discussion
- Topic: Monitoring Moisture
 - Review Graphs
 - Notebook

Explanation

- Topic: Observations of Weather Conditions
 - Video
 - Observe Water in Winter and Summer
 - Notebook
- Topic: Weather and the Earth System
 - Interactive
 - Mountain Weather
 - Notebook
 - Writing Assignment
 - Discussion

Application

- Topic: Warm and Cold Fronts
 - Interactive
 - Compare and Contrast Warm and Cold Fronts
 - Notebook
- Topic: Reading a Meteogram
 - Review Graphs
 - Notebook
- Topic: Reading a Weather Map
 - Images
 - Notebook
 - Discussion
- Topic: Scientific Visualizations
 - Video
 - Earth System: Satellites
 - Notebook

- Images
- Discussion

Putting It into Practice

Topic: Teaching About Weather

- Notebook
- Discussion
- Images
- Writing Assignment

SESSION 2: CLIMATE CHANGE

Session Structure w/ topics, delivery method, and specific videos and readings

Invitation

Topic: An Introduction to Climate

- Notebook
- Interactive
 - Observe Images of Different Climate Zones
- Discussion

Topic: Connecting Weather Patterns and Climate

- Video
 - 20-Year Map of Global Rainfall
- Notebook
- Discussion

Exploration

Topic: Past Climates

- Notebook
- Video
 - Climate Change
- Discussion

Topic: Oceans and Climate Regulation

- Notebook
- Interactive
 - Examine Global Surface Currents
- Discussion
- Review Map
- Audio
 - Great Ocean Conveyor Belt
- Notebook
- Discussion

Topic: Earth's Greenhouse

- Notebook
- Video
 - Global Warming: Carbon Dioxide and the Greenhouse Effect
- Discussion

Topic: Collecting Climate Change Data

- Video
 - Taking the Earth's Temperature
- Notebook
- Reading
 - "CO₂ Concentrations at Mauna Loa Observatory"
- Discussion

Explanation



Topic: Evidence of Climate Change

- Video
 - Natural Climate Change in Djibouti, Africa
- Discussion
- Writing Assignment

Application

Topic: Studying Records of Past Climate Change

- Reading
 - “Global Warming: Graphs Tell the Story”
- Notebook
- Interactive
 - Greenland Ice Sheet Project 2: A Record of Climate Change
- Discussion

Putting It into Practice

Topic: Global Warming Science and Controversy

- Notebook
- Reading
 - “Greenhouse Effect in the Classroom: A Project- and Laboratory-Based Curriculum”
- Lesson Plan
 - Global Climate Change: Understanding the Greenhouse Effect
- Discussion
- Writing Assignment

Final Assignment

Topic: Global Weather Connections

- Video
 - Ocean Temperatures and Climate Patterns
 - Earth System: El Niño
- Writing Assignment

Schedule

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

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.