

Instructors:

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Goals:

- *to think like scientists:*
examples: identifying unanswered questions, formulating hypotheses, planning experiments, assembling chains of reasoning, drawing inferences from observations.
- *to look at the natural physical earth with informed eyes:*
examples: Why are there mountains around the edges of North America, and a flat part in the middle? Why does the earth have oceans and continents? What causes volcanoes?
- *to understand the impact of the earth on human affairs:*
examples: Why is there so much oil in Saudi Arabia? Why are there destructive earthquakes in California, Mexico, Japan, Armenia?

Pedagogical Framework:

“To develop competence in an area of inquiry, students must (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in ways that facilitate retrieval and application.” (from Committee on Developments in the Science of Learning, 2000, *How People Learn: Brain, Mind, Experience and School*, National Academy Press, p. 16.)

Format:

Content Days

The quote above tells us that competence in an area of inquiry begins with a foundation of factual knowledge. Content days, and the work you do in preparation for Content Days, are aimed at building that foundation. In preparation for a Content Day, you should read the assigned chapter of the textbook, and think through answers to the “Questions for Review” at the end of the chapter.

When you come into class, you will be given a piece of paper with two questions: “What (if anything) did you find confusing or hard to understand in the reading?” and “What did you find most interesting in the reading?” These answers will be collected but not graded.

Then you will get a second piece of paper with two questions. The first will be one of the “Questions for Review” from the current week’s reading. The second will be one of the “Questions for Review” from any of the previous weeks’ readings. These answers will be collected, and graded, and will count for 20% of your grade.

The next segment of the Content Day, will be an instructor-led discussion/presentation of the topics’s factual knowledge base, with an emphasis on those concepts that the most students said were most confusing or most interesting.

The discussion will also work towards establishing a “contextual framework” for the week’s facts and ideas. Examples of “framework” concepts which we will revisit again and again include plate tectonics as an organizing principle for solid earth processes, and “systems thinking” ideas of flows of mass and energy.

Active Learning Days

The quote above tells us that competence in an area of inquiry requires organizing mental knowledge in a way that you can do something with it,—you can pull up the relevant piece of information and use it to solve a problem, or to defend a position, or generalize to a new situation, or do something else useful or interesting.

On “active learning days,” you will do something with your new found factual knowledge and conceptual framework. For example, you might be asked to bring your factual knowledge to bear on interpreting a data set. Or you might be asked to design an experiment to test a hypothesis. Or you might be asked to connect your book-learned factual knowledge to processes and objects that you have observed during your years of life on Planet Earth.

These in-class activities will be carried out in a cooperative learning mode, working in pairs or threesomes.

Assessment:

- *20%: Content mastery quizzes* (you can make up missed content quizzes at office hours, limit two make-ups per semester)
- *20%: in-class activities* (there are no make-up sessions for in-class activities, but we drop the two lowest scores for the semester)
- *20%: midterm*
- *20%: proposal*

You should identify an unanswered question in earth sciences, and propose a strategy to help solve it. Your strategy could involve making measurements, collecting samples, building a model, or any other approach that might constrain or answer the question you have posed. ***You do not have to answer the question:*** you only have to pose the question clearly, and outline a viable course of action, which, if followed, has a decent chance of helping to answer the question. Maximum length: four pages.

- *20%: final*

Textbook:

Skinner, B. J., S. C. Porter and D. B. Botkin, 1999, *Blue Planet*, John Wiley and Sons.

Schedule:

<i>Topic</i>	<i>Content Day</i>	<i>Activity Day(s)</i>	<i>Instructor</i>	<i>Reading</i>
Introduction		W Jan 21	Kastens	
The Earth System	M Jan 26	W Jan 28	Kastens	B.P.: Ch 1 (skip Nitrogen Cycle)
Solar System/Planets	M Feb 2	W Feb 4	Anderson	B.P.: Ch 2
The Sun, Giver of Life	M Feb 9	W Feb 11	Kastens	B.P. Ch 3
Plate Tectonics	M Feb 16	W Feb 18, M Feb 23	Anderson	B.P.: Ch 4
Earthquakes	W Feb 25	M March 1	Kastens	B.P.: Ch 5
Volcanoes	W March 3	M March 8	Kastens	B.P : Ch 7
Midterm		W March 10	Anderson	
SPRING BREAK				
Continents/Mountain Building	M Mar 22	W Mar 24	Anderson	B.P.: Ch 8 (skip Metamorphism)
Water on Land	M Mar 29	W Mar 31	Kastens	B.P.: Ch 9
The World Ocean	M Apr 5	W Apr 7	Kastens	B.P.: Ch 11
Field Trip to AMNH Hall of Planet Earth		M Apr 12	Anderson + Barbour	
Mineral and Energy Resources	W Apr 14 <i>Proposal Question due</i>	M Apr 19, W Apr 21	Anderson	B.P. 18
Global Change	M Apr 26 <i>Proposal Working Hypotheses due</i>	W Apr 28	Anderson	B.P.: 20
Review Session;	M May 3 <i>Proposal due in cl</i>		Anderson	