

# Integrated Approaches to Earth Sciences Education I

## SMT503

### Fall 2014

**Course overview:** This course will cover aspects of Earth's systems and dynamics and develop the concepts and skills associated with teaching that material. The scientific content of the course includes the study of Earth by following the flow of energy and the cycling of matter through its many systems. The teaching methods highlighted in the course derive from a curriculum design model that helps focus student learning on essential concepts and skills. In the context of the earth sciences, participants in the course will use this model to determine what is essential, what evidence will be accepted for demonstrating understanding, and what pedagogies to use (and when to use them) to develop that understanding.

**Number of credit hours:** 3

**Meeting time:** Monday, 4:10-6:40 pm, Room 203, Bryand Global Sciences Center

**Prerequisites (previous courses, knowledge, and skills):** Graduate standing or permission

#### Faculty Information

Christopher Gerbi

Phone: 581-2153; E-mail address: [christopher.gerbi@maine.edu](mailto:christopher.gerbi@maine.edu)

Where students may leave physical messages/assignments: 111 Bryand Global Sciences Center

Office hours: open door policy, or by appointment

#### Instructional Materials

*Understanding by Design*, 2e, by G. Wiggins and J. McTighe

*Essentials of Geology*, S. Marshak, W.W. Norton & Co. or similar introductory book.

Some additional resources:



Earth Science Literacy Initiative: <http://www.earthscienceliteracy.org/>

Next Generation Science Standards: <http://www.nextgenscience.org/next-generation-science-standards>

<http://teaching.uncc.edu/articles-books/best-practice-articles/course-development/best-practices>

<http://www.cwsei.ubc.ca/resources/COPUS.htm>

#### Learning framework

*Course Goal:* To foster a collaborative environment for developing instructional materials and identifying best instructional practices in the natural sciences.

*Instructional Objectives:*

- Practice creating teaching materials at a variety of scales
- Discuss a range of instructional styles and approaches
- Discuss the methodology for developing goals and teaching materials, particularly out of field



*Student Learning Outcomes:*

Upon successful completion of this course, you will be able to:

- Develop and justify effective instructional modules for Earth science topics
- Demonstrate the skills and tools to accurately assess student learning
- Explain fundamental processes of the Earth system and interactions of its sub-systems.

## Grading and Course Expectations

This course requires active engagement on your part. In fact, the course will not function if you do not bring ideas and questions to class every day. If you will miss class, please let me know ahead of time.

Active, germane participation in class discussions	20%
Development of instructional materials and other written products	60%
Final exercise	20%

Final date for all work to be in, other than the final exercise, unless you have made other arrangements:  
12 December 2014

## Policy Statements

*Academic honesty (plagiarism, etc.)* Academic dishonesty includes cheating, plagiarism and all forms of misrepresentation in academic work, and is unacceptable at The University of Maine. As stated in the University of Maine's online undergraduate "Student Handbook," plagiarism (the submission of another's work without appropriate attribution) and cheating are violations of The University of Maine Student Conduct Code. An instructor who has probable cause or reason to believe a student has cheated may act upon such evidence, and should report the case to the supervising faculty member or the Department Chair for appropriate action.

*Students with disabilities statement:* If you have a disability for which you may be requesting an accommodation, please contact Ann Smith, Director of Disabilities Services, 121 East Annex, 581-2319, as early as possible in the term.

*Schedule disclaimer:* In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

## Workload expectations

### (Nearly) weekly

- complete readings
- develop short responses to the reading
- complete written assignments (learning outcomes, syllabus, teaching philosophy, big ideas, etc.)

Once or twice during the semester: develop and present a mock class

### What you will turn in this semester:

<i>Teaching philosophy</i>	15 Sept	<i>Portfolio</i>	10 Oct
<i>Lesson</i>	as comp	<i>Revised lesson</i>	8 Dec
<i>Final exercise</i>	15 Dec		

## Course components and tentative schedule

Most weeks, our class meetings will follow a similar format. The first hour or so will be discussion of the reading and the topics listed on the schedule. In the second hour, one person will lead a mock class. The third hour we will use to critique that mock class and follow up on issues raised. The mock class is an ultra-low risk opportunity for you to try new instructional ideas.

You should put your reading responses and any questions that come up during the semester in a "diary". I will not collect the diaries, and we will not be able to get to all questions every class, but we will make time for "diary discussions" some weeks.

To do for	Reading	Discussion topics (good topics for reflections in your diary)	Assignment for next week	Lesson by
8 Sep	Intro; Ch 1 in UbD	Learning outcomes How do you teach out of field? What is the role of the instructor? Does it vary from course to course or class to class?	<ul style="list-style-type: none"> <li>Draft learning outcomes (course level)</li> <li>Write teaching philosophy</li> <li>Line up classroom observations</li> </ul>	CG
15 Sep	Ch 2 in UbD; COPUS paper, especially p. 624-626	LO feedback What is backward design? Is it the way to go? How planned should a course be? What is “understanding”?	<ul style="list-style-type: none"> <li>Revise LO</li> <li>Draft assessment(s) for at least one LO</li> <li>Complete classroom observations</li> </ul>	Dan Darlene (plate tectonics)
22 Sep		Assessment feedback Classroom observations observations [Share teaching philosophies]	<ul style="list-style-type: none"> <li>Revise LO and assessment(s)</li> <li>Draft a syllabus around the LO</li> </ul>	Derek Grace (groundwater)
29 Sep	Ch 3 in UbD	Syllabus – how to make it all work Role of out-of-classroom instruction (and challenges)	<ul style="list-style-type: none"> <li>Revise syllabus</li> <li>Create an out-of-classroom activity</li> </ul>	Justin Leif (glaciers)
6 Oct	Ch 10 in UbD	Little things about being in the classroom	<ul style="list-style-type: none"> <li>Portfolios due Friday (LO, assessment, syllabus, philosophy if revised)</li> </ul>	Marina Oai (ocean currents)
20 Oct	Learning cycle scenario	The learning cycle: a proposal How do you identify Big Ideas?	<ul style="list-style-type: none"> <li>Proposal response</li> <li>Complete Big Ideas at the program level</li> </ul>	Rachel Stephanie (geography and climate)
27 Oct		Big Ideas – present and defend	<ul style="list-style-type: none"> <li>Revise Big Ideas and look ahead</li> </ul>	William Dan (earthquakes?)
3 Nov	Mogk and Goodwin	Outside the walls	<ul style="list-style-type: none"> <li>Mini-lesson using “fieldwork” [walk-throughs]</li> </ul>	Darlene Derek
10 Nov		Field mini-lesson walk-throughs	<ul style="list-style-type: none"> <li>Identify a misconception and prepare an instructional approach to address it [walk-throughs]</li> </ul>	Grace Justin
17 Nov		Misconception walk-throughs Diary discussion	<ul style="list-style-type: none"> <li>Personal strategies for syllabus/lesson development</li> </ul>	Leif Marina
24 Nov		Report out strategies	<ul style="list-style-type: none"> <li>Revise Lesson 1 for peer review</li> </ul>	Oai Rachel
1 Dec		Peer review; how to address challenges	<ul style="list-style-type: none"> <li>Revise lesson</li> <li>Final exercise</li> </ul>	Stephanie William
8 Dec		Present revised lessons	<ul style="list-style-type: none"> <li>Final exercise</li> </ul>	
Finals week		Final Exercise presentations		