

**ISE 870 - TEACHING COLLEGE SCIENCE**  
**Spring 2013**

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Office Hours by Appointment

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**General Course Goal:** To introduce participants to the theory and practice of student-centered college teaching. Students will be able to use an understanding of how people learn, the basics of curriculum design, and a range of teaching and assessment strategies and instructional technology to plan for, teach, and analyze effective science teaching.

Note: bullets are objectives for each day

Date:	Topic	Homework due
Jan 7	<b>Introduction: Student-centered teaching and backward design</b> <ul style="list-style-type: none"> <li>• clarify objectives and expectations of course</li> <li>• identify the range of syllabus components and the role of each</li> </ul> In class reading - Code of Teaching Responsibility	Bring sample syllabus
Jan 14	<b>How people learn and implications for teaching</b> <ul style="list-style-type: none"> <li>• describe how people learn</li> </ul>	Read <ul style="list-style-type: none"> <li>• Rutherford &amp; Alhgren - Chpt 13</li> <li>• Bodner</li> <li>• CC - chpt3</li> <li>• Redish - Sec 2 - 4</li> </ul>
Jan 28	<b>Objectives and assessment in backward design</b> <ul style="list-style-type: none"> <li>• analyze and write course and content objectives and associated assessment based on big ideas in the discipline and departmental, university, and national standards</li> </ul> In class reading - Bloom	Read: <ul style="list-style-type: none"> <li>• Wiggins &amp; McTighe</li> <li>• Angelo &amp; Cross</li> </ul>
Feb 4	<ul style="list-style-type: none"> <li>• analyze and write course and content objectives and associated assessment</li> </ul>	Write sample obj & assessment Read:

	In-class reading: Woodin <i>et al.</i> ; A Framework for K12 Science Education <b>Teaching strategies</b> <ul style="list-style-type: none"> <li>plan for effective information presentation</li> </ul>	• Bransford <i>et al.</i>
Feb 11	<b>Mini-lecture I - presenting information</b> <ul style="list-style-type: none"> <li>plan, deliver, and analyze lectures</li> </ul>	Mini-lecture
Feb 18	<b>Textbooks &amp; helping students read</b> <ul style="list-style-type: none"> <li>evaluate a textbook from multiple perspectives</li> <li>design activities that support students' reading</li> <li>other sources of text</li> </ul> In-class reading: Helping College Ss Read	bring textbook & completed evaluation Howard C.C.
Feb 25	<b>Student-centered teaching and active learning</b> (PBL, case studies, clickers, <i>etc.</i> ) <ul style="list-style-type: none"> <li>observe and analyze active learning situations and materials</li> </ul>	Report on classroom observations Gijbels <i>et al.</i>
Mar 4	<b>Spring Break</b>	
Mar 11	<b>Group work in large classes</b> <ul style="list-style-type: none"> <li>articulate principles for designing and managing group work</li> <li>research and analyze instructional technology and its role in promoting learning</li> <li>identify multiple purposes of labs, demos, and instructional technology</li> </ul> In class - Types of Labs, NSES Inquiry	Johnson <i>et al.</i> Beichner <i>et al.</i>
Mar 18	<b>Observe and analyze active learning situations and materials</b> <b>Student-centered teaching and active learning</b> Hybrid courses - Duncan Sibley, guest speaker <ul style="list-style-type: none"> <li>develop laboratory materials for investigations</li> <li>observe and analyze active learning situations and materials</li> </ul>	Bring sample of an in-class activity Herman
Mar 25	<b>Science-specific teaching strategies and instructional technology</b> Group work - Tammy Long, guest speaker <ul style="list-style-type: none"> <li>articulate principles for designing and managing group work</li> <li>research and analyze instructional technology and its role in promoting learning</li> </ul>	Report on instructional technology
Apr 1	<b>3 purposes of assessment</b> <ul style="list-style-type: none"> <li>analyze student work for the purpose of giving feedback to students</li> <li>use assessment data to modify instruction</li> <li>write a rubric for grading an open-ended assignment</li> </ul>	Smith and Tanner

	<b>Teaching Philosophies</b> In class - Montell	
Apr 8	<b>Mini-lecture II - active learning</b> <ul style="list-style-type: none"> <li>• plan, deliver, and analyze active learning tasks</li> </ul>	Mini-lecture
Apr 15	<b>Multiple responsibilities of university instructors and students</b> <ul style="list-style-type: none"> <li>• guest speaker, MSU Ombudsman</li> </ul> <b>Equity issues</b> <ul style="list-style-type: none"> <li>• develop solutions to scenarios involving equity issues</li> </ul>	
Apr 22	<b>Presentations</b> <ul style="list-style-type: none"> <li>• develop and implement instructional materials based on sound educational principles</li> </ul>	Presentations <b>Written projects due Tue Apr 30</b>
May 3	<b>Presentations 10 - 12 am</b> <ul style="list-style-type: none"> <li>• develop and implement instructional materials based on sound educational principles</li> </ul>	Presentations Portfolios

## Readings

**Jan 7** - Code of Teaching Responsibility from MSU Faculty Handbook.

**Jan 14** - Rutherford & Ahlgren (1990) *Science for All Americans. Chpt. 13 Effective Learning & Teaching*. Washington: Oxford Press.  
<http://www.project2061.org/tools/sfaaol/Chap13.htm>

**Jan 14** - Bodner (1986) *Constructivism: A Theory of Knowledge*, J. Chem. Ed 63. pp.873-878.

**Jan 14-** Sterberg & Ben-Zeev (2001) *Complex Cognition: The psychology of Human Thought*. New York: Oxford Press. Pp. 31 - 57.

**Jan 14** - Redish (2003) *A Theoretical Framework for Physics Education Research: Modeling Student Thinking*. The Proceedings of the Enrico Fermi Summer School in Physics, Course CLVI (Italian Physical Society, 2004). Concentrate on sections 2 - 4.

**Jan 28** - Wiggins & McTighe (1998) *Understanding by Design*. Alexandria, VA: Assoc. for Supervision & Curric .Dev. pp. 9 - 13, 18.

**Jan 28** - Angelo & Cross (1993) *Classroom Assessment Techniques: A Handbook for College Teachers*. San Francisco, CA: Jossey-Bass, Inc.

**Jan 28** (in class) - Bloom (1954) *Taxonomy of Educational Objectives*. NYC, NY: Longman.

**Feb 4** - Bransford *et al.* (2000) *How People Learn: Brain, Mind, Experience, and School*. Washington: National Academy Press. Pp 170-180.  
[http://www.nap.edu/openbook.php?record\\_id=9853&page=R1](http://www.nap.edu/openbook.php?record_id=9853&page=R1)

**Feb 4** (In class) - Woodin *et al.* (2010) *Vision and Change in Biology Undergraduate Education, A Call for Action—Initial Responses*. CBE—Life Sciences Education Vol. 9, 71-73.

**Feb 4** (In class) - A Framework for K12 Science Education. (2011) NRC. Chpt 4 + Core concepts of your discipline.

**Feb 4** (Reference) - National Research Council, Committee on Undergraduate Science Education (1997) *Science Teaching Reconsidered*. Chpt. 2 How Teachers Teach, Specific Methods - Lectures. Washington, DC: National Academy Press.  
[http://www.nap.edu/catalog.php?record\\_id=5287](http://www.nap.edu/catalog.php?record_id=5287)

**Feb 18** - Evaluation of College Textbooks.

**Feb 18** - Howard Community College, Faculty Resources, Chapter 1: Critical Thinking: Teaching College and University Students to Think Critically and Evaluate.  
[http://intranet.howardcc.edu/Faculty\\_Resources/TeachingResources/pdf/Ch1\\_Critical\\_Thinking\\_F01.pdf](http://intranet.howardcc.edu/Faculty_Resources/TeachingResources/pdf/Ch1_Critical_Thinking_F01.pdf)

**Feb 18** (In class) - Helping College Students Read

**Feb 25** - Gijbels, Dochy, & Van den Bossche (2005) *Effects of Problem-Based Learning: A Meta-Analysis From the Angle of Assessment*. Review of Educational Research, Vol. 75, No. 1, pp. 27-6.

**Mar 11** - Johnson, Johnson, & Smith (2000) *Cooperative Learning*.

**Mar 11** - Beichner & Saul (2003). *Introduction to the SCALE-UP (Student-Centered Activities for Large Enrollment Undergraduate Programs) Project*. Proceedings of the International School of Physics - Enrico Fermi, Varenna, Italy, (July 2003).

**Mar 25**- Herman (1998) *Inserting an Investigative Dimension into Introductory Laboratory Courses*. J Chem Ed 75, (1) pp. 70 - 72.

**Mar 25** - Teaching and Learning through Inquiry (Ed. Lee), Chpt 1.

**Mar 25** (In class) - Types of Laboratory and Inquiry Experiences.

**Apr 1** - Smith & Tanner (2010) *The Problem of Revealing How Students Think: Concept Inventories and Beyond*. CBE Life Sci Educ 9(1): 1-5.

**Apr 1** (In class) - Montell (2003) *How to Write a statement of Teaching Philosophy*. Chronicle of Higher Education. 3/27/2003.

**Useful resource** - MSU Handbook for Teaching Assistants, <http://www.msu.edu/~taprog/resources/handbook2002/>

### **Final Project**

You and one or two other classmates will collectively write a syllabus for a course. In addition each of you will write a lesson plan for the same course. As a team you will teach a portion of one of the lesson plans to the class on April 22 or May 3. The written project is due Apr 30. For more details, see the Final Project Guidelines.

### **Teaching Portfolio**

You will put together a teaching portfolio that documents your teaching experience to date as well as your teaching philosophy. It should also be organized so that you can easily add artifacts from additional experience. The teaching portfolio is due May 3. For more details, see the Teaching Portfolio Guidelines.

### **Grading**

This course is graded on a pass/no pass basis. Requirements for a passing grade are:

- regular attendance and participation in class including mini-lectures (if you must miss a class session, please contact me ahead of time about makeup work.)
- completion of class assignments including the final project and teaching portfolio.