

BIOL 270T: COLLEGE SCIENCE TEACHING

SYLLABUS

Spring 2018	California State University, Fresno
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Course Description

This course is designed for graduate students in the sciences and graduate students in science education who are interested in improving their science teaching and their students learning, and in pursuing careers in college science teaching. **Central Course Question:** *How do college students best learn science and thus how do we best teach them?*

The preparation of future scientists is intense, and typically emphasizes disciplinary knowledge and research. However, many science graduate students will be expected to teach in their careers. Approximately 75% of faculty positions in the U.S. are at institutions where the importance of teaching and professional service is equal to or greater than the emphasis on research. Many people with science degrees take positions at universities characterized as “teaching institutions.” It follows then, that some attention to learning about science teaching and learning is essential in the preparation of science graduate students.

We know from recent studies that: 1) university students often leave science majors due to poor teaching, 2) K-12 students do not measure up when it comes to understanding science, and 3) public understanding of science is at an all time low. It is the responsibility of future science faculty to strive to create, not just future scientists, but a scientifically literate populace prepared to deal with important issues that face the world that require understanding science. Thus the broader purpose of this course is to contribute to the reform of science education, K-20.

Learning Goals

1. This course is designed to help you develop the knowledge necessary for effective teaching of college science. By the end of this course, I expect that you will:
2. Have a deeper understanding of principles related to science learning (knowledge of learners);
3. Know how to set goals for student learning (knowledge of curriculum);
4. Understand the essential features and effective sequences of inquiry-based science instruction (orientations and knowledge of instruction);
5. Develop a repertoire of interactive teaching strategies for diverse learners that address science learning goals in different contexts: a) large lectures, b) discussion sections, and c) laboratories.

6. Understand the importance of linking assessment with learning goals (knowledge of instruction);
7. Develop a repertoire of formative and summative assessment strategies and scoring techniques (knowledge of assessment);
8. Synthesize your understanding of goals, strategies, and assessment to apply to the evaluation and development of college science curricula.
9. Develop the disposition to reflect on practice and seek out continuing opportunities for professional development.

Textbooks and Materials

Materials

One 2” three-ring binder

Five tabbed dividers

Notebook paper

An electronic device (computer, tablet, or smart phone)

Required Textbooks

Committee on Undergraduate Science Education. (1997). *Science teaching reconsidered: A handbook*. Washington, DC: National Academy Press. Available online at <http://www.nap.edu/catalog/5287.html>

Mintzes, J. J., & Leonard, W. H. (Eds.). (2006). *Handbook of college science teaching*. Arlington, VA: NSTA Press.

Grading Scale		
A ≥ 90%	C = 70 – 79.99999%	
B = 80 – 89.99999%	D = 60 – 69.99999%	F = 0 – 59.99999%

Course Policies

When in class, I expect you to be engaged and participating actively. This means that email, texting, homework for other classes, Facebook, YouTube, and online shopping can wait. If this becomes a problem, I may ask you to leave your computer or phone at home.

Checking Email and BlackBoard

You are expected to please check your Fresno State email daily and pay attention to the available materials on BlackBoard, including readings, videos, and the grade book. The only way I have to communicate with you is using these electronic means. Please be diligent in staying connected.

Contacting Dr. Walter

Email is the best way to reach me. I usually respond to emails within 24 hours. However, if I am busy or out of town, it may take me longer to respond. Please use proper letter etiquette and spelling when emailing me (or any professor). Include our course name (BIOL 270T) in your email subject line for a faster response.

Late Assignment Policy

Late assignments will be deducted 10% (one letter grade) for every 24 hours late.

Do not let a computer crash or lack of Internet cause your assignments to be late! Please back up your work on the cloud and on a flash drive. Be prepared to act on your feet should technical difficulties arise.

Attendance Policy

Students are expected to attend all scheduled class sessions. However, due to circumstances beyond your control (ex: illness) or within your control (ex: out of town trip) you may have to be absent during the semester at some point. I recommend that your absences should be used only for circumstances beyond your control. All students are allotted two absences (regardless of the reason) without penalty. **Your final course grade will be lowered by 5% if you miss more than 2 classes. This could potentially affect your final letter grade.**

As a courtesy to your classmates and me, you need to let me (Dr. Walter) know when you will be out of class so that accommodations in group structure and related plans can be made. If absent, it is your responsibility to ensure any assignments due are turned in, and to find out what tasks you need to complete. Please note that given the hands-on nature of our course, many in-class activities cannot be "made up."

Extra Credit Policy

At this time, I do not plan to offer extra credit for this course.

Policy on Plagiarism Detection

The campus subscribes to Turn-it-in and the SafeAssign plagiarism prevention service through Blackboard, and you will need to submit written assignments to Turn-it-in/SafeAssign. Your work will be used for plagiarism detection and for no other purpose. You may indicate in writing that you refuse to participate in the plagiarism detection process, in which case I can use other electronic means to verify the originality of your work. Turn-it-in and/or SafeAssign Originality Reports **will be available** for your viewing upon request.

Writing Style Requirements

All assignments should be written in accordance with APA style (6th Ed.). A full explanation of APA style can be found in:

American Psychological Association. (2010). *Publication manual of the American Psychological Association* (6th Edition). Washington, DC: Author.

Some APA highlights that you should particularly pay close attention to:

- Levels of headings
- Running head and page numbers
- Quotation citations
- Reference citations in text
- Reference list requirements

APA style suggests that writing in third person may at times be ambiguous. Like APA, I prefer that you write your papers in first person when appropriate (as in a philosophy statement). APA style also suggests using an “active voice” in writing rather than a “passive voice.” Again, I concur and prefer that you write your papers in “active voice.” In other words, avoid constructions where the subject is not present (the test was administered), and replace with an active subject (the professor administered the test). The giveaway for passive voice is the explicit or implicit “by” (e.g., in the example above, “by the professor” is implicit).

University Policies

Policy on Students with Disabilities

If you need accommodations because of a disability, you have emergency medical information to share with me, or you need special arrangements in case the building must be evacuated, **please inform me as soon as possible**. Please see me privately after class or at my office.

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in Henry Madden Library, Room 1202, (559) 278-2811.

The University Honor Code

Members of the Fresno State academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities. You should:

- a) Understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)
- b) Neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
- c) Take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

I may require you to sign a statement at the end of all exams and assignments that “I have done my own work and have neither given nor received unauthorized assistance on this work.”

University Policy on Cheating and Plagiarism

Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work.

Penalties for cheating and plagiarism range from a zero or F on a particular assignment, an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Computers

At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services or the [University Bookstore](#). In the curriculum and class assignments, students are presumed to have 24-hour access to a computer and the necessary communication links to the University's information resources.

Disruptive Classroom Behavior

The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. Differences of viewpoint or concerns should be expressed in terms that are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop an understanding of the community in which they live. Student conduct that disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class.

Copyright Policy

Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its [Copyright Web Page \(http://libguides.csufresno.edu/copyright\)](http://libguides.csufresno.edu/copyright).

Technology Innovations for Learning & Teaching (TILT) course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material.

You may download one copy of course materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material.

Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

Family Educational Rights and Privacy Act (FERPA)

Federal law (FERPA) strictly prevents me from discussing your grades or class performance with your parents (or anyone else) without your permission. If you DO want me to discuss your performance with them or anyone else, you must complete and sign a document waiving privacy rights. Federal law does not make an exception because your parents are paying for your education. If there is a question about your grades, please come see me yourself; you are the only one with whom I can discuss your class performance.

Support for Student Parents

Should you have difficulty with obtaining childcare on a given day, *you are welcome to bring your child with you to class.* I trust you to know whether you could successfully bring your child to class. From my perspective, your child is welcome to attend class and (a) participate or (b) do other activities, such as read, watch videos (with headphones), play video games, color, etc.

If you are breastfeeding and need to step out for a period longer than our planned breaks, please feel free to do so. Should you miss class time based on this need, we will work on finding a way to summarize what went on during your absence.

If there is anything else I can do to support you as a parent, please let me know.

Tentative Course Schedule

Spring 2018

The schedule and procedures for this course are *subject to change* to remain responsive to the general pace of the course, your learning needs, and for extenuating circumstances. *Note.* BB = Blackboard.

Date	Topics	Readings (on BB unless otherwise specified)	Tasks / Assignments Due
<i>Week 1</i> Jan 17	Course Intro The Problem Why we need quality college science teaching	<ul style="list-style-type: none"> <i>The Neglected Learner</i> 	- Make a slide for Google Slideshow presentation
<i>Week 2</i> Jan 24	Models of Learning How People Learn	<ul style="list-style-type: none"> How People Learn, Ch. 1-3 <i>Science Teaching Reconsidered</i>, Ch. 3 Mintzes & Leonard, Ch. 12 	<ul style="list-style-type: none"> - Analogy drawing (scan and upload) - Complete online survey of teaching practices and beliefs - Interview Project: Talk to a faculty member about the science ideas that students struggle with (for course of your choice)
<i>Week 3</i> Jan 31	Science learners and alternative conceptions	<ul style="list-style-type: none"> <i>Science Teaching Reconsidered</i>, Ch. 4 Fisher & Moody (2002) 	
<i>Week 4</i> Feb 9	Interview Practice	<ul style="list-style-type: none"> Osborne & Freyberg (1985) 	<ul style="list-style-type: none"> - Curriculum Project: Take the Teaching Goals Inventory, bring scores to class - Curriculum Project: Start a list of possible Learning Goals for your course (use readings and videos to help) - Interview Project: Find participants and start to conduct misconception interviews
<i>Week 5</i> Feb 16	Learning Goals, Policy, and Standards for Science Learning	<ul style="list-style-type: none"> Video Modules: Learning Objectives (see BB for Links) <i>Vision and Change</i>, Chapter 2 <i>Mintzes & Leonard</i>, Chapter 32 Kober (2015), pp. 1-5 Freeman et al. (2014) Bybee (2009), pp. 1-11 Lord (2007) 	- Interview Project: Bring data from interviews

Date	Topics	Readings (on BB unless otherwise specified)	Tasks / Assignments Due
<i>Week 6</i> Feb 23	Evidence-Based Practice and the 5E Instructional Model	<ul style="list-style-type: none"> • <i>Mintzes & Leonard</i>, Ch. 4, 5, 8, 23 (read assigned chapter) • <i>What is Interactive Lecture? and Why Use Interactive Lecture?</i> (links on BB) 	Curriculum Checkpoint #1: Learning Goals
<i>Week 7</i> March 2	Interactive lecture; Active learning strategies I: Demonstrations; 5E revisited	<ul style="list-style-type: none"> • <i>Science Teaching Reconsidered</i>, Ch. 2 (lectures) • <i>Mintzes & Leonard</i>, Ch. 15, 20 	Interview Project Due
<i>Week 8</i> March 9	Active learning strategies II: Problem based learning and the case method; Critical thinking; 5E revisited	<ul style="list-style-type: none"> • <i>Mintzes & Leonard</i>, Ch. 18 • <i>Problem Based Learning</i> Video Modules (links on BB) 	Curriculum Checkpoint #2: Lecture
<i>Week 9</i> March 16	Active learning strategies III: team building and collaborative learning and conceptual change; 5E revisited	<ul style="list-style-type: none"> • <i>Science Teaching Reconsidered</i>, Ch. 2 (discussions, collaborative learning) • <i>Socratic Seminars</i> (on BB) • Colosi & Zales (on BB) 	
<i>Week 10</i> March 23	Laboratory instruction; Turning cookbooks into inquiries; 5E revisited	<ul style="list-style-type: none"> • <i>Mintzes & Leonard</i>, Chapter 21 • <i>Science Teaching Reconsidered</i>, Chapter 2 (laboratories) • Volkman & Abell (2003), on BB 	Curriculum Checkpoint #3: In Class Activity Curriculum Checkpoint #4: Talk to faculty member about labs that “don’t work well” and bring copies to class
<i>Week 11</i> March 30	Assessment I: Connecting goals to outcomes; levels of questioning	<ul style="list-style-type: none"> • <i>Science Teaching Reconsidered</i>, Chapter 5 • <i>Mintzes & Leonard</i>, Ch. 35 • <i>Video Module: How to Align Objectives and Assessments</i> (link on BB) 	
<i>Week 12</i> April 6	Assessment II: Tests	<ul style="list-style-type: none"> • <i>Science Teaching Reconsidered</i>, Chapter 6 (Testing and Grading) • Bean (2001) - on BB • <i>Sci Teaching Recon</i>, Ch. 1* • <i>Mintzes & Leonard</i>, Ch. 36* <p>* Helpful for teaching philosophy assignment, read when you’re ready</p>	Curriculum Checkpoint #5: Converted Lab Complete Teaching Philosophy: First draft, bring 2 paper copies for peer review

Date	Topics	Readings (on BB unless otherwise specified)	Tasks / Assignments Due
April 13	Spring Break	<ul style="list-style-type: none"> No Class 	
<i>Week 13</i> April 20	Assessment III. Thinking, Writing, and Grading	<ul style="list-style-type: none"> <i>Mintzes & Leonard</i>, Chapter 19 	Internship Paper Due
<i>Week 14</i> April 27	Culturally Competent Teaching Putting it all together: Building a Syllabus	<ul style="list-style-type: none"> <i>Science Teaching Reconsidered</i>, Ch. 7, 8 How To Build a Syllabus PodCast http://www.learningscientists.org/blog/2017/1/6/weekly-digest-41 	
<i>Week 15</i> May 4	Motivation, discipline, class management; Evaluating teaching Overcoming Barriers to about Successful College Teaching	<ul style="list-style-type: none"> <i>Mintzes & Leonard</i>, Chapter 3 <i>Evaluating and Improving Undergrad Teaching</i> Setting boundaries Heppert et al. 	Teaching Philosophy: Final Draft
<i>Final</i> May 18 3:30 - 5:30 pm	Curriculum Symposium	Share your curriculum project materials with visiting faculty while we enjoy food and evidence-based teaching practices.	Curriculum Development Project – Final Binder, Poster, and Handouts

Finals week	Days	Dates
Final Exam Preparation & Faculty Consultation Days:	Thursday and Friday	May 11 – 12
Final Semester Examinations	Monday-Thursday	May 15 - 18
Final Exam in this course (curriculum symposium)	Thursday	May 18 3:30-5:30 pm

Assignments and Grading

Assignment	Due Date	% of Grade
<p>Participation: This class will be highly interactive and will require your active and thoughtful participation in activities and discussions.</p>	N/A	15%
<p>Join a Learning Community. Seeking resources and workshops to improve your teaching will be key to becoming an effective instructor. For this assignment, you must attend and write a one-page reflection for each of two (2) College of Science and Mathematics FLOCK professional development meetings. These are held once a month on Fridays from 11-Noon and lunch is provided. All reflections are due the following class period from the date you attended. Dates of the lounges are in the “due date” column.</p>	Feb. 3 Mar. 3 Apr. 7 May 5	5%
<p>Misconceptions Project: Through interviewing two adult learners about their understanding of concepts basic to your area of science (e.g. biology, chemistry). This assignment helps you begin to understand some of the challenges that you face as a college science instructor.</p>	Feb. 24	15%
<p>Mini-internship: You will be matched with a professor on campus who is recognized for his/her science teaching. You will then observe instruction and talk with the professor about teaching. A brief summary and analysis is required.</p>	April 20	20%
<p>Curriculum development project (final project): Using what you learned in your interview, and synthesizing course readings and class sessions, you will craft a module for part of a college science course, including learning goals; teaching strategies; and assessments. You will present your product at a poster session at the curriculum symposium at the end of the course.</p>	Feb 23 March 9 March 23 March 30 May 18	30%
<p>Teaching philosophy statement: When you begin the academic job search process, you will likely be asked to include a teaching statement in your application. This assignment will ask you to prepare such a statement.</p>	April 6 May 4	15%

Discussion Participation Guide

Benefits of Discussion

Our success in this course depends on the degree to which we can establish a discourse community committed to ideals of democratic discussion. Brookfield and Preskill (1999) delineate the potential benefits of discussions:

1. Helping students explore a diversity of perspectives.
2. Increasing students' awareness of and tolerance for ambiguity or complexity.
3. Helping students recognize and investigate their assumptions.
4. Encouraging attentive, respectful listening.
5. Developing new appreciation for continuing differences.
6. Increasing intellectual agility.
7. Helping students become connected to a topic.
8. Showing respect for students' voices and experiences.
9. Helping students learn the processes and habits of democratic discourse.
10. Affirming students as co-creators of knowledge.
11. Developing the capacity for the clear communication of ideas and meaning.
12. Developing habits of collaborative learning.
13. Increasing breadth and making students more empathic.
14. Helping students develop skills of synthesis and integration.
15. Leading to social change.

Discussion Dispositions

Yet for these benefits to accrue, lively interactions among critically conversing participants are essential. This is where your responsibility as a class participant comes to bear. Brookfield and Preskill (1999) describe the dispositions that students and teachers need to practice in order for discussions to be successful.

1. **Hospitality:** We will try to establish an atmosphere in which people feel invited to participate. Hospitality implies a mutual receptivity to new ideas and perspectives, and a willingness to question even the most widely accepted assumptions. We must balance seriousness of purpose with lightness of tone, and employ self-deprecating humor when the tension becomes too great.
2. **Participation:** Discussions work best when a large number of class members participate on a variety of occasions about a variety of topics, contributing depth and subtlety to the discussion. Many of us need to feel efficacious about our participation--that our participation matters and is having an impact on others.
3. **Mindfulness:** Paying close attention to the words of others, although difficult, is critical to successful discussions. We need to try to pay attention to the whole conversation--to who has spoken and who has not, to what has been said and not said--and defer to those who have not yet spoken. Another component of mindfulness is tact, not compromising our principles, but checking our desire to express ourselves fully and vociferously in light of the whole conversation.
4. **Humility:** We must demonstrate the willingness to admit that our knowledge and experience are limited and incomplete. We must acknowledge that others in the group have ideas to express that might teach us something or change our minds about something. Humility also implies the inclination to admit errors in judgment.
5. **Mutuality:** It is in the interest of us all to care as much about each other's self-development as about our own. We must realize that our own growth depends in a vital sense on the growth of all others. Such a spirit will generate goodwill, generosity, and trust among participants. We become more

willing to take risks and speak frankly when we know our actions are likely to be seen as mutually beneficial. Mutuality also implies that each of us must be willing to alternative between the roles of teacher and student in our participation.

6. **Deliberation:** We must be willing to discuss issues as fully as possible by offering arguments and counter-arguments that are supported by evidence, data, and logic and by holding strongly to these unless there are good reasons not to do so. We must express our views forcibly, though civilly. Consensus will not always be our goal; sometimes it may be just as desirable if deliberation results in continuing differences' being better understood and more readily tolerated. Deliberation also involves an evaluation of how effectively the problem has been resolved.
7. **Appreciation:** We need to find space and time to express our appreciation to one another. When a helpful comment clarifies a key point, or an intriguing comment excites further discussion, we should express our gratitude openly and honestly. Such expressions of gratitude can appear overdone and seem sentimentalized, so we must take care to be authentic in our appreciation.
8. **Hope:** The main reason for any dialogue is the hope of reaching new understanding. Hope sustains us through the complexity and provides us with the sense that our time and efforts are worth it. Hope implies what Dewey called "democratic faith," that pooling the talents and abilities of individuals increases the likelihood that new light will be shed on understanding.
9. **Autonomy:** Participants who retain the courage, strength, and resolve to hold to an opinion not widely shared by others should be given their due. We should honor autonomy as a temporary state where an individual can claim his/her beliefs; yet that same individual should be willing to subject those beliefs to continuous reevaluation and possible revision.

Note. This discussion guide has borrowed heavily from the language in:

Brookfield, S. D., & Preskill, S. (1999). *Discussion as a way of teaching: Tools and techniques for democratic classrooms*. San Francisco, CA: Jossey-Bass.

Student Responsibilities

As a member of this class, you are responsible for developing these nine dispositions throughout the course. I do not think we can take these dispositions lightly. They will be difficult to achieve in practice and will take constant personal attention. However, if each of us is committed to the ideals these dispositions represent, and to our own professional growth, we will make progress toward productive discussions.

Secondly, you are responsible for coming to class prepared. Preparation includes reading, writing, and thinking about the issues at hand prior to class. If our discussions are to be deliberative and mutual, we must have a shared basis for discussion, along with the personal knowledge and experience we bring to bear. Your final responsibility will to evaluate your contributions to the discussion by completing a self-evaluation (see below) at mid term and at the end of the semester.

Discussion Self-Evaluation

Name _____ Date _____

*Please read each statement and evaluate yourself using the following scale:
(4=almost always, 3=often, 2=sometimes, 1=seldom or never)*

Preparation for Discussion

- I read the assigned readings thoroughly for each week. _____
- I prepared for the discussion by highlighting, outlining, concept mapping, or some other technique. _____
- I noted questions and reactions I had about the readings, and responded thoughtfully to reading response assignments. _____

Large Group Discussion

- I practiced hospitality by inviting all perspectives. _____
- I communicated my insights and opinions. _____
- I listened to the ideas of others. _____
- I stayed focused on the topic under discussion. _____
- I acknowledged the limits of my thinking. _____
- I practiced mutuality between the roles of teacher and student. _____
- I offered evidence and logic in support of my views. _____
- I explicitly appreciated the contributions of others. _____

Small Group Discussion

- I offered my ideas. _____
- I listened to the ideas of others. _____
- I took notes. _____
- I represented my group as spokesperson. _____

TOTAL SCORE _____

Please comment on your strengths and weaknesses with regard to class discussions:

Syllabus Signature Page

California State University - Fresno

Instructor: Dr. Emily Walter

Course: BIOL 270T

Semester: Spring 2017

I _____, agree that I received a copy of the course syllabus for the class mentioned above. I understand the course requirements and that I am expected to attend all class meetings and events. **I understand that if I miss more than two class sessions that my grade will be reduced by 5%.**

Print Full Name

Signature

Date