Education 185L Seminar/Cal Teach 3
Spring, 2017

Location: Jack Baskin School of Engineering, room 160
Class Time: Thursday, 5:20 – 6:55 p.m.
Instructor: Molly Shaw, Ed.D.
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Office Hours: before or after class

Cal Teach 3 analyzes how we learn and teach mathematics and science. We will examine assumptions about learning, teaching, and schooling; as well as consider the contexts and practices that appear to best support the development of students' scientific and mathematical understanding. We will discuss theory and research on learning, and use these frames to help make sense of our own work and observations in our host classrooms, and how we design instruction.

Grading and Assignments

Grades will be based on participation in class discussions and activities (10%), written assignments (80%), and your final presentation (10%). Written assignments may be e-mailed to me, or printed out and handed in during class, whichever is easier for you. Please pay close attention to the due dates -- we have five of them! Late papers are vehemently discouraged and will receive a lowered grade unless you and I have made prior arrangements. Weekly attendance is expected; please let me know if you have to miss a class meeting. Unexcused absences will result in a lowered overall class grade.

Academic Integrity

Like all endeavors in the university, this course holds to the UCSC guidelines for academic integrity, which can be found here: http://www.ue.ucsc.edu/academic_misconduct. Unless otherwise explicitly noted, all assignments are to be completed by individual students and represent each student's original work. Potential violations will be taken seriously, following university procedure.

Classroom Accommodations

If you qualify for classroom accommodations because of a disability, please obtain an Accommodation Authorization from the Disability Resource Center (DRC) and submit it to me within the first two weeks of the quarter. Contact DRC at 459-2089 or http://drc.ucsc.edu for more information on the requirements and/or process.

Assignments

Analysis Paper

Please write an analysis (3-5 pages) and turn it in by week 8: Describe a lesson you have observed in your placement classroom. Identify and discuss the main learning theory or

theories evident in the teacher's instructional approach to the lesson. Cite at least 4 scholarly articles/chapters from your Cal Teach and/or Education courses (or elsewhere) and include a bibliography in APA or MLA format.

Project: Design a Complete Teaching Unit

In CaT2, you developed a lesson designed to teach one or more content standards. For CaT3, your teaching project is intended to provide a context for you to combine multiple lessons within a complete and coherent pedagogical frame. You will plan a short instructional unit (3-5 lessons) on a topic of your choice. This unit may be related to your work in your host classroom, or it can be a unit you would like to teach one day to middle or high school math or science students. Describe what the students will learn, how they will be taught, how you will evaluate their learning, and how you will evaluate your teaching. Provide justification for the educational theory or theories behind your choice of teaching methods. The components of this project will be due throughout the quarter (weeks 3, 5, 7, and 9).

1. **Introduction** due week 3: write 3-5 pages describing the unit you will teach, brief descriptions of the topics you will teach, and overall learning goals for students.

2. **Unit activities** due week 5: provide three to five lessons using the template which is on my Cal Teach web page. ***Include an additional 2-3 pages explaining why you chose to teach the topics in that particular sequence.***

3. **Unit assessments** due week 7: write 3-5 pages describing how you will assess your students, using both formative (during instruction and/or during the unit) and summative (after all instruction is completed) evaluation techniques. Further, please describe how you will evaluate the effectiveness of your teaching. Cite at least 4 scholarly articles/chapters in this section from your Cal Teach and/or Education courses (or elsewhere) and include a bibliography in APA or MLA format. You might find some additional helpful information on assessment in the Perrone, *et al.* reference on my web page.

4. **Unit learning theory** due week 9: write 3-5 pages describing the learning theory or theories utilized in your teaching strategy. Why did you choose the teaching methods you did? Cite at least 4 scholarly articles/chapters in this section from your Cal Teach and/or Education courses (or elsewhere) and include a bibliography in APA or MLA format.

Final Presentation

Your final presentation should last approximately 15 minutes, and will take place in either Week 9 or Week 10. *Discuss* the instructional unit you have prepared, *describe* the activities you will incorporate into the lesson, *provide rationales* for your lesson and activity designs (citing specific learning theories), explain your assessment plans, and

provide any other information you find particularly interesting and relevant. Feel free to include a demonstration in your presentation.

Class Schedule

Week 1: April 6	• What is good teaching? • Math word problems as Common Core assessments • Air pressure lab
Week 2: April 13	• Brooks & Brooks (discussion) • Student-led lab
Week 3: April 20	• Cai, *et al.* (discussion) • **Project Introduction due** • Student-led lab
Week 4: April 27	• Duckworth (discussion) • Student-led lab
Week 5: May 4	• Marzano and/or Mead (choose Mead especially if you read the Marzano chapter in another class) (discussion) • **Project Activities and Explanatory Paper due** • Student-led lab
Week 6: May 11	• Clough (discussion) • Student-led lab
Week 7: May 18	• Leonard, *et al.* (discussion) • **Project Assessments due** • Student-led lab
Week 8: May 25	• Richtel (discussion) • **Classroom-placement Lesson Analysis due** • Student-led lab
Week 9: June 1	• Presentations • **Project Learning Theory due**
Week 10: June 8	• Presentations • Have a wonderful summer!!

Readings

1. Brooks, J. & Brooks, M. (2001). *In Search of Understanding: The Case for Constructivist Classrooms*, pp. 3-14. New Jersey: Prentice Hall.

1. Eleanor Duckworth (p. 5) will propose a situation for students to think about, and waits to hear what they make of it. Propose a situation which might help you gain insight into your students' thinking.

2. What do you make of the lesson described on p. 11? What do you think about the authors' comments?

3. If you have the time, please see my web page link "Constructivist Classrooms" for more of a math-oriented analysis of constructivism. How would you assess the pedagogical effectiveness of the geometry activities described?

2. Cai, J., Moyer, J.C. & Laughlin, C. (1998). Algorithms for solving non-routine mathematical problems. In L. J. Morrow & M.J. Kenney (Eds.), *The Teaching and Learning of Algorithms in School Mathematics*, pp. 218-229.

1. Would you incorporate this method in a middle-school math class? How? Would you encourage students to generate their own algorithms in a high-school math class? In a science class? How?

2. What are the benefits of student-generated algorithms? Are there risks? How do you think you might approach these questions when you are a teacher?

3. Clough, M.P. (2002). Using the laboratory to enhance student learning. In R. Bybee (Ed.), *Learning Science and the Science of Learning*, pp. 85-94. Arlington, VA: National Science Teachers Association.

1. What does "hands-on is not enough" (p. 87) mean?

2. On p. 90, the author inserts questions into a traditional "cookbook" lab. What does this add; or, does this add anything substantive? Should this be applied to math teaching?

4. Duckworth, E. (1986). Teaching as research. *Harvard Educational Review, 56*(4), 481-495.

1. How would you elicit evidence of conceptual understanding on topics such as evolution, exponential growth, or density?

2. How could you engage students in making sense of curriculum? Does making sense lead to curriculum (p. 493)? What does the author mean here?

5. Leonard, J. et al. (2010). The nuances and complexities of teaching mathematics for cultural relevance and social justice. *Journal of Teacher Education 61*(3), 261-270.

Propose some CRP (culturally relevant pedagogy) and SJP (social justice pedagogy) scenarios for math and science lessons in your field.

6. Marzano, R. (2003). Direct vocabulary instruction: An idea whose time has come. In B. Williams (Ed.), *Closing the Achievement Gap* (pp. 48-66). Alexandria, VA: Association for Supervision and Curriculum Development

Consider Marzano's six steps on page 62, and develop a sequential process for learning a specific academic term in your field. How does this method of instruction compare to how you yourself learned the term?

7. Mead, R. (2016). Learn different: Silicon Valley disrupts education. *The New Yorker.* Retrieved from http://www.newyorker.com/magazine/2016/03/07/altschools-disrupted-education

1. Please compare personalized learning (p. 2) with Leonard's culturally relevant pedagogy (CRP) and social justice pedagogy (SJP).

2. Mead describes teachers' roles on pages 8 and 9 regarding the analysis of student progress and in carrying out "robot tasks." Consider this organizational methodology from the possibly different perspectives of an administrator compared with a classroom teacher.

3. Which elements of AltSchool's model might be transferable to a standard public school in which a teacher might see 150 students a day, all of whom will take state and/or national tests at the end of the academic year?

8. Richtel, M. (2011). In classrooms of future, stagnant scores. *The New York Times*. Retrieved from http://www.nytimes.com/2011/09/04/technology/technology-in-schools-faces-questions-on-value.html?_r=0

1. What does "technology" mean in the field of education?

2. Compare this reporting from 2011 to what you observe in classrooms today.

Unit/Lesson templates
(based on the UCSC 2011 templates, revised by Shaw, 2016)

Unit Title:	**Course Title and Grade Level:**

Content Standard(s):
Prior Knowledge Needed for This Unit:

Enduring Understanding(s) (or, what is the big picture?):
Essential Question(s) (or, what does this unit specifically address or answer?):
What critical thinking skills will students need to be successful? (for a helpful list of terms, please take a look at this page: http://www.criticalthinking.org/pages/glossary-of-critical-thinking-terms/496)
What oral and written forms of language will help students participate successfully in this sequence?
What essential vocabulary will students need to use in this unit?

Lesson 1 Title:

Lesson Plan

(a useful organizing tool is the 5E model from BSCS; for additional information, please see http://bscs.org/bscs-5e-instructional-model)

Keep in mind that a "lesson" does not have to be limited to one class period.

Engagement - students' prior knowledge accessed and interest engaged in the phenomenon
Exploration - students participate in an activity that facilitates conceptual change
Explanation - students generate an explanation of the phenomenon
Elaboration - students' understanding of the phenomenon challenged and deepened through new experiences
Evaluation - students assess their understanding of the phenomenon

Materials Needed:

What evidence will show that students understand the lesson's goals?

Formative (i.e., during instruction):

Summative (i.e., after instruction):

What criteria will you use to assess and evaluate understanding and skills?

Equity: what scaffolds and other learning elements have you included to help all students meet high expectations in these lessons?

Add more lessons as necessary.