California State University San Marcos
SCHOOL OF EDUCATION

EDUC 495 – STEM Teaching and Learning, Theory and Practice

SPRING 2013 Academic Hall 204
Tuesday 4:00-5:30 pm

Professor: Brian R. Lawler, Ph.D. Office phone: (760) 750-4260
Office: 319 University Hall Email: blawler@csusm.edu
Office hours: by appointment

Mission Statement of the School of Education, CSUSM

The mission of the School of Education Community is to collaboratively transform public education by preparing thoughtful educators and advancing professional practices. We are committed to diversity, educational equity, and social justice, exemplified through reflective teaching, life-long learning, innovative research and on-going service. Our practices demonstrate a commitment to student-centered education, diversity, collaboration, professionalism, and shared governance. *(Adopted by COE [SoE] Governance Community, October, 1997).*

Course Description

The course is designed for students serving as Learning Assistants (LAs) in undergraduate STEM courses. The course will help integrate educational theory, pedagogy, and practice. It will touch on theoretical issues such as conceptual development, conceptual change, collaborative learning, technology in education, and students' conceptions of various topics in mathematics and science. It will also focus on practical issues encountered in facilitating learning, managing the classroom, formative and summative assessment, curricula, and differentiating instruction in a collaborative environment. This is a seminar-style course where students are responsible for weekly readings, in-class discussions, and project presentations all based on the Learning Assistant field placement.

Student Learning Outcomes

As a result of this course, students will be able to:

- Identify univocal vs. dialogic discourse in a STEM classroom
- Apply appropriate questioning strategies in their work as a Learning Assistant
- Understand the role of drawing out and listening to student thinking in the STEM classroom in order to teach content
- Utilize student misconceptions to design learning/teaching scenarios
- Manage group investigations into a topic/concept in their field of expertise
- Evaluate student activity to determine if it is one of "doing science," or "doing school"
- Identify the intellectual activity of STEM teaching, including the ongoing opportunities to do math or do science as a teacher

Course Requirements

Prerequisites Accepted as a CSUSM or Palomar Learning Assistant.

Required Texts Weekly course readings will be available online through Cougar Courses (CC).

Key Assignments

This course is a seminar, and its success will depend on the active participation of all members in helping to shape its ultimate content and relevance. Our primary activity will be in-depth discussions of course topics and readings. Requirements include the following:

1. *Class Discussion/Participation (20%)* – Class members are expected to contribute to class discussions. The purpose of these discussions is to help us as individuals, and as a group, develop meaningful interpretations of the ideas conveyed by the readings and to make connections to the class members' teaching experience. There will be weekly questions regarding the assigned article(s). Responses should be submitted electronically. The expectation is that students are attending every class session and participating in the discussions.

2. *Weekly Reading & Teaching Reflections (20%)* – Each class member is expected to answer a collection of questions based on the weekly article reading. Post responses to CC. You may find it helpful to keep a copy of your weekly teaching and reading reflections so that you can refer back to them when writing your article reports.

   LA is expected to spend approximately 5-7 hours per week working with STEM undergraduates in collaborative, learner-centered environments. Using this experience as a guide, fill out weekly teaching reflection questions. Post responses to CC. These reflections may be shared with the CSM lead faculty; however, LA names - not departments/courses – will be removed.

   After several weeks, if you have only interacted with a handful of students (and/or mainly on an individual basis), contact your LA course instructor (me). Course assignments and the LA model assume you are regularly engaging with small groups of students.

3. *Article Reports (20%)* –Submit a 750-1000 word reflective paper on a selected pair of readings. Further details will be given on CC.

4. *Interview / Peer Observation / FCQ (20%)* – (A.) Each LA will be required to conduct an interview to practice questioning and to better understand another's ideas about a scientific or mathematical concept. Results of this interview will be written up and used in class discussions and summarized in online written reflections. (B.) In addition, each LA will complete and submit a written summary of a field observation of another LA. During the LA Seminar, you will also have a consultation session with the LA you observed. (Likewise, you will also be observed and participate in a consultation session.) (C.) Once during the semester, you will hand out an evaluation form (FCQ) to the students you work with and then analyze the resulting data. These data should be prepared in graphical/tabular form for presentation to small groups in the LA Seminar and also submitted to the instructor.

5. *Weekly Meetings with Lead Faculty in Mathematics and Science to Plan Instruction (10%)* – Each week, LAs are responsible for meeting with the CSM lead faculty to plan and reflect on instruction and to discuss student achievement. Students cannot pass the LA Seminar course if they fail to meet with the Lead Instructor each week.

   If you find that your Lead Instructor is not meeting with you, notify your LA course instructor immediately so that this can be corrected.

6. *Poster Project (10%)* – The purpose of this project is for class members to apply and synthesize what has been learned related to teaching, learning, mathematics, technology, engineering, science, and students. Class members will develop a poster presentation that describes changes or development of beliefs about student learning and the appropriate teaching that facilitates that learning. The aspects of teaching and learning identified should reference sources in the literature and experiences as an LA.

Grading

Course grades will be based on the following grading scale:

A	…..	Excellent	…..	90 –	100%
B	…..	Above Average	…..	80 –	89%
C	…..	Average	…..	70 –	79%
F	…..	Failing	…..	less than 70%	

Unless *prior arrangements* have been agreed to with the instructor, work submitted late, but within one week of the due date will be reduced by one letter grade, and work received over one week late will receive no credit.

School of Education Attendance Policy
Due to the dynamic and interactive nature of courses in the School of Education, all students are expected to attend all classes and participate actively. At a minimum, students must attend more than 80% of class time, or s/he may not receive a passing grade for the course at the discretion of the instructor. Individual instructors may adopt more stringent attendance requirements. Should the student have extenuating circumstances, s/he should contact the instructor as soon as possible. *(Adopted by the COE Governance Community, December, 1997).*

All University Writing Requirement

All CSU students must demonstrate competency in writing skills as a requirement for graduation. At California State University San Marcos, students complete the graduation writing assessment through the All-University Writing Requirement. This requirement mandates that every course at the University must have a writing component of at least 2,500 words (approximately 10 pages). The assignments for this course meet this requirement.

CSUSM Academic Honesty Policy

"Students will be expected to adhere to standards of academic honesty and integrity, as outlined in the Student Academic Honesty Policy. All written work and oral presentation assignments must be original work. All ideas/materials that are borrowed from other sources must have appropriate references to the original sources. Any quoted material should give credit to the source and be punctuated with quotation marks.

Students are responsible for honest completion of their work including examinations. There will be no tolerance for infractions. If you believe there has been an infraction by someone in the class, please bring it to the instructor's attention. The instructor reserves the right to discipline any student for academic dishonesty in accordance with the general rules and regulations of the university. Disciplinary action may include the lowering of grades and/or the assignment of a failing grade for an exam, assignment, or the class as a whole."

Incidents of Academic Dishonesty will be reported to the Dean of Students. Sanctions at the University level may include suspension or expulsion from the University.

Plagiarism: As an educator, it is expected that each student will do his/her own work, and contribute equally to group projects and processes. Plagiarism or cheating is unacceptable under any circumstances. If you are in doubt about whether your work is paraphrased or plagiarized see the Plagiarism Prevention for Students website http://library.csusm.edu/plagiarism/index.html. If there are questions about academic honesty, please consult the University catalog.

Students with Disabilities Requiring Reasonable Accommodations

Students with disabilities who require reasonable accommodations must be approved for services by providing appropriate and recent documentation to the Office of Disable Student Services (DSS). This office is located in Craven Hall 4300, and can be contacted by phone at (760) 750-4905, or TTY (760) 750-4909. Students authorized by DSS to receive reasonable accommodations should meet with their instructor during office hours or, in order to ensure confidentiality, in a more private setting.

Tentative* Schedule

Date	Topic	Assignment to be completed BEFORE class **
Session 1 22 jan 2013	Introduction to the Theory and Practice of STEM Teaching & Learning	
Session 2 29 jan 2013	Classroom Discourse	Knuth, E., & Peressini, D. (2001). Unpacking the nature of discourse in mathematics classrooms. *Mathematics Teaching in the Middle School*, *6*(5), pp. 320-325.
Session 3 5 feb 2013 *guest*	Introduction to Clickers – a vehicle to increase quality of teacher-student interactions	Mazur, E. (2002).
Session 4 12 feb 2013 *guest*	Teaching Inquiry-Based Science in K-12	
Session 5 19 feb 2013	Classroom Discourse: Dialogic versus Univocal Questions and Questioning, including Bloom's Taxonomy Interview Techniques *Discuss interview protocol*	Trowbridge, L.W., Bybee, R.W., & Powell, J.C. (2000). Questioning and discussion. In *Teaching Secondary School Science: Strategies for Developing Scientific Literacy* (1st ed.). Upper Saddle River, NJ: Merrill.
Session 6 26 feb 2013	Learning Theory I: Mental models *Discuss protocol for LA observation*	Redish, E. (1994). Implications of cognitive studies for teaching physics. *American Journal of Physics*, *62*(9).
Session 7 5 mar 2013	LA observation consultation	**4B. LA Observation due** Otero, V.K., Nathan, M.J., (2008). Preservice elementary teachers' views of their students' prior knowledge of science. *Journal of Research in Science Teaching, 43*(4).
Session 8 12 mar 2013	Formative Assessment	Moss, C., & Brookhart, S. (2009). The lay of the land: Essential elements of the formative assessment process. In *Advancing Formative Assessment in Every Classroom: A Guide for Instructional Leaders*. Alexandria, VA: ASCD.
Session 9 19 mar 2013	Student Ideas in Content Areas *Debrief interviews*	**4A. LA Interview due** Select one of the miscellaneous articles posted on CC relevant to topical areas.
Session 10 26 mar 2013 *dinner*	LA Celebration & Recruitment event	
Session 11 9 apr 2013 *guest*	Cooperative Learning Motivation	Frey, N., Fisher, D., Everlove, S. (2009). Defining productive group work. In *Productive Group Work*. Alexandria, VA: ASCD. Frey, N., Fisher, D., Everlove, S. (2009). Promoting face-to-face interactions. In *Productive Group Work*. Alexandria, VA: ASCD. Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology*. *84*(3), pp. 261-271.
Session 12 16 apr 2013	Metacognition / Argumentation The Nature of Science / The Nature of Mathematics *Hand out FCQ evaluation forms*	**4C. LA Feedback due** Schoenfeld, A. (1987). What's all the fuss about metacognition? In A. Schoenfeld (Ed.) *Cognitive Science and Mathematics Education* (pp. 189-215). Hillsdale, NJ: Lawrence Erlbaum Associates. Jimenez-Aleixandre, M., Rodrigues, A., & Duschl, R. (2000). "Doing the lesson" or "doing science": Argument in high school genetics. *Science Education, 84,* pp. 757-792.

Date	Topic	Assignment to be completed BEFORE class **
Session 13 23 apr 2013	Learning Theory II: Cognitive and socio-cultural frameworks *Discuss FCQ data collected from your students.*	**3. Article Report due** Zull, J.E. (2002). The art of changing the brain: Enriching the practice of teaching by exploring the biology of learning. *Stylus*. Sterling, VA. Ch. 1-3. Lemke, J.L. (2001). Articulating communities: Sociocultural perspectives on science education. *Journal of Research in Science Teaching*, *38*(3), pp. 296-316. Lederman, N.G. (1998). The state of science education: Subject matter without context. *Electronic Journal of Science*, *3*(2).
Session 14 30 apr 2013	Qualities of Effective Teachers Multiple Intelligences and Differentiated Instruction	Stronge, J.H. (2002). *Qualities of effective teachers*. Washington, DC: ASCD. Armstrong, T. (2000). MI and cognitive skills. In *Multiple Intelligences in the Classroom* (2nd ed.). Washington, DC: ASCD. Tomlinson, C.A. (1999). *The differentiated classroom*. Washington. DC: ASCD.
Session 15 7 may 2013	Standards and Learning Goals Large-scale and International Math and Science Assessments *Poster Session*	**6. Poster Project due** National Research Council. (2011). *A framework for k-12 science education: Practices, crosscutting concepts, and core ideas.* http://www.nap.edu/catalog.php?record_id=13165#toc National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common core state standards for mathematics. Washington, DC: Authors.* http://www.corestandards.org/Math

* This schedule is an *approximation*. Given the nature of this course, we will likely be altering the scheduled topics and possibly times and dates in order to accommodate student interest and learning opportunities. In particular, reading assignments are likely to adjust as the class unfolds.