EDSTEM 82 002 - SEM 002: Teaching and Inquiry-Based Lesson Design in the Science and Mathematics Classroom

Fall 2024

Instructor: Sagit Betser

Seminar: Tuesday, 4 – 6 pm

Location: Dwinelle 130

Practicum: a minimum of 12 hours

Office Hours: by appointment, email: sagit@berkeley.edu

Course Description
This course surveys basic approaches to K-8 science and math teaching through modeling inquiry-based teaching and discussion. Topics include inquiry-based pedagogy, assessment techniques, lesson plan design and revision, and child development. Students are placed in science and math learning environments with elementary and middle school children to practice teaching. This seminar offers an opportunity to explore teaching, foster children's natural curiosity, and inspire local students.

Course Overview
This course will provide students with:

- support for developing a high-quality STEM teaching experience
- an opportunity to explore K – 8 teaching in science, mathematics, or computer science as a career
- an understanding of barriers to and strategies necessary for advancing equity in STEM education
- an introduction to the theory and practice necessary to design and deliver excellent instruction

To gain first-hand experience in planning and implementing inquiry-based curricula, students will work with K-8 students in STEM classrooms. Students will attend two hours of class on campus each week, where they will become familiar with science and mathematics curricula for K-8 students and learn to design, teach, and assess effective inquiry-based science/mathematics sessions. Field placements are selected to meet the needs of K-8 teachers in Berkeley schools.

The course design emphasizes collaborative group work, class discussions, and peer observations to improve STEM teaching competency as the semester progresses. The course also guides the writing of lesson plans, focusing on the importance of formulating specific learning and performance objectives, using effective open-ended questioning strategies throughout teaching sessions, utilizing formative assessments to evaluate learning, and analyzing student artifacts to improve future teaching. Additionally, consistent attention will be given to issues of equity in curriculum, instruction, and interactions with students. Students will submit and present a final project during the last week of instruction. Alignment with a number of Teaching Performance Expectations (**TPEs**) required by the California Commission on Teacher Credentialing is highlighted below.

Student Learning Outcomes

Students will be able to…	***Evidence of Student Learning:***
Demonstrate science or mathematics content knowledge in the design and teaching of K-8 lessons.	Contextual information describing student STEM content learning needs, STEM content, and alignment with grade-appropriate K-8 common core content and practice standards
Identify and use exemplary sources of inquiry-based science and mathematics lessons	Participation in and critique of model lesson demonstrations selected from exemplary sources
Design and teach inquiry-based lessons using the 5E Instructional Model.	Three inquiry-based lesson plans Written feedback on lesson plans from instructor and/or peer Reflection on oral feedback from teachers and students
Build relationships with K-8 students to establish safe learning environments.	Reflection on oral feedback from student and teachers Written feedback on lesson plans from instructor and/or peer Written feedback from classmate following observation of session
Use formative and summative assessments aligned to learning objectives in order to evaluate students' prior knowledge and student learning, provide instructive feedback to K-8 students, and revise lesson plans.	Analysis of student work, and accompanying reflection with proposed revisions
Reflect on teaching experiences to improve teaching and learning.	Thoughtful reflections in weekly journal entries Revised lesson plan sequence for final project
Identify unique attributes of elementary and adolescent students and plan age-appropriate strategies targeted to learning needs of K-8 students.	Participation in class discussions that address the unique attributes of children of different ages Thoughtful reflections in weekly journal entries addressing age-appropriate teaching and learning
Use probing questions to elicit feedback to determine students' acquisition of knowledge.	Create and revise open-ended questions and expected responses for different STEM content. Written feedback from classroom session

Discuss and use strategies for achieving instructional equity in classroom settings.	Participation in class discussions that address issues of inequity in schools. Thoughtful reflections on use of strategies that promote culturally responsive pedagogy. Teaching philosophy statement addressing intentions for promoting equitable learning in classroom learning environments
Use educational technology intentionally and creatively for supporting STEM learning.	Participation in and critique of model lesson demonstrations selected from exemplary sources Incorporating effective instructional technology application and platforms
Provide constructive and compassionate feedback to peers on their teaching.	Written feedback provided to peers on lesson planning and implementation. Oral feedback shared peer-to-peer on each other's ability to provide useful feedback
Reflect on their personal interest in teaching and STEM education as a career path.	Final reflection on STEM teaching and learning experiences during course

Course Expectations & Grading Policy

Attendance and Participation (20%):
Class sessions focus on collaborative activities and discussions to explore best practices in teaching and learning while enhancing the collective understanding of K-8 students' cognitive and social-emotional needs. Students are expected to attend all classes and participate actively. Because of the emphasis on community and collaboration, students may not miss more than two classes during the semester. All absences should be communicated to the instructor before the impacted session date.

Readings and Weekly Journal Reflections (20%):
Weekly journal assignments offer an opportunity to critically reflect on your classroom experiences, course readings, field placements, and the ideas discussed in this course. You should aim to write one to two paragraphs each week, and be prepared to discuss your responses in the online forum and in class with peers. Entries are to be posted on the class website 48 hours before class to allow time for your instructor and peers to read and respond. All journal entries must be completed to receive a passing grade.

Fieldwork: Classroom Placement (20%):
This course requires at least 12 hours of fieldwork in a teaching placement, where students will be expected to participate one hour per week over the course of the semester in a STEM subject. Fieldwork placements will be arranged by the CalTeach program to best fit your schedule and the needs of K-8 teachers. You will need to track your fieldwork hours using the provided log sheet or online portal. Specific instructions on how to track and submit these hours will be provided at the beginning of the course.

Assignments (40%):

You will develop and submit three assignments. Each assignment focuses on a different aspect of your experience in the course, building towards a final project that synthesizes your learning. Detailed instructions and deadlines for each assignment will be provided in class.

Assignment #1: Serving as a College-Going Role Model (5%)
Plan how you will introduce yourself to the students in your placement and build a relationship with them. This assignment focuses on sharing aspects of your educational journey, such as who or what has motivated you, and how you are being supported at Berkeley. In addition, you will need to write about how you plan to get to know the students, including strategies for understanding their interests, needs, and learning styles. Consider what 'big ideas' you want to convey and how you will engage students in getting to know you. Be prepared to reflect on this experience in class discussions.

Assignment #2: Lesson Plan (15%)
Use the CalTeach 5E Lesson Plan Template to create a lesson designed to engage students in a STEM topic relevant to your placement experience. You will submit the cover page along with the Engage/Explore sections and the evaluation components for these sections. Include any worksheets, discussion questions, transition techniques, and sample problems or scientific phenomena necessary for your lesson introduction. You will practice your lesson with a small group of peers in class (for about 15 to 20 minutes) and incorporate their feedback into your final submission.

Assignment #3: Unit Plan (20%)
Complete a full Unit Plan that includes three lessons. The unit plan should engage students through inquiry-based exploration, implementing culturally relevant teaching, promote equitable participation, and encourage the sharing and listening to diverse ideas and perspectives. Your unit planning will be supported by peer review and instructor feedback, and you will submit your final unit along with a reflection on the process.

Schedule of Topics

Topics and readings are subject to change.

Date	Tuesday	Reading for class	Assignment Due Date
1 9/3	**Introduction**		
2 9/10	**Inquiry-based learning**	*"Be Less Helpful" from Math Teacher's Circle Network (2012). p4 -7*	
3 9/17	**Inquiry-based learning**	*Models and Modeling Introduction*	Assignment #1: 9/19
4 9/24	**NGSS (Science Standards)** **5E lesson plan**	*Video: How to Read the Next Generation Science Standards.* *https://www.youtube.com/watch?v=Q6eoRnrwL-A*	
5 10/1	**Common Core Math Standards** **Growth Mindset** **Content vs. Pedagogical**	• *Common Core Math, Jo Boaler:* *https://www.youtube.com/watch?app=desktop&v=pOOW0hQgVPQ*	

	Knowledge	*&embeds_referring_euri=https%3A%2F%2Fbeyondtraditionalmath.com%2F&feature=emb_imp_woyt* • *Ball et al. (2008) Content Knowledge for Teaching*	
6 10/8	**Facilitation and Assessment**	*TBD*	
7 10/15	**Assignment 2 Peer Review**		
8 10/22	**STEM Identity & Learning Environments**	*What is STEM Identity? An Interview with Heidi Carlone*	Assignment #2
9 10/29	**Collaborative Learning**	*Jigsaw articles (TBD)*	
10 11/5	**Engineering Design & Equitable Learning Spaces**	*Martin, The Promise of the Maker Movement in Education*	
11 11/12	**Culturally Responsive Teaching, Belonging and Equity**	*Gutiérrez & Rogoff, Cultural Ways of Learning: Individual Traits or Repertoires of Practice*	
12 11/19	**Meeting the needs of diverse learners**	*Every Kid Needs a Champion (8 min)* *https://www.youtube.com/watch?v=SFnMTHhKdkw*	
13 11/26	**Technology & Inquiry based Pedagogy.**	*TBD*	
14 12/3	**Assignment #3 Peer Assessment**		
15 12/10	**Reflections**		Assignment #3