ED 267D | Spring 2019 Elective

CURRICULUM & INSTRUCTION IN SCIENCE

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Course Overview

This course will focus on preparing pre-service teachers to transfer their current understanding of teaching in one subject matter to the specific pedagogical strategies used in teaching science. We expect that teachers in this course will not necessarily be subject matter experts, therefore they will be drawing on their experience as teachers to apply their understanding to the exciting and wonderful ideas of science. We hope that our teacher candidates might be able to use this course in many ways: to get an additional credential in science, to develop and consider how to teach integrated units connected to science, and/or to increase their knowledge about a different way of thinking as a scientist.

In this intensive introduction to the teaching of science we expect students:

- To describe and practice the cognitive apprenticeship model as we understand it in the context of science teaching.
- To read and interpret the Next Generation Science Standards (NGSS) in order to effectively plan learning experiences in science content.
- To design and present their rationale for teaching a lesson plan in a scientific area, which eventually, would lead to planning learning segments and unit plans based on students' skills, backgrounds and needs.
- To analyze and assess pre-assessments for/of student learning in an effort to create, revise and improve their classroom instruction.
- To compare and contrast the teaching of science with their understanding of teaching in another content area.

Course Expectations

This course is designed to create a collegial culture in which we can all learn from one another. To facilitate this culture, we expect everyone to come to class having completed the readings for that session and to be prepared to participate in activities and discussions. Candidates are expected to demonstrate the same level of professionalism as demanded of any credentialed teacher with respect to time management, communication, and integrity. We also expect people to listen carefully and respectfully to their colleagues. Our collective engagement in class activities and discussions will facilitate your learning; we therefore assume regular attendance. All assignments will be used in class on the day they are due, so you will need to have them ready to upload by the start of class. Absences are for major illness or family emergencies only. In such instances, students are responsible for contacting instructors at least 24 hours before class and completing any work missed due to absence. All readings will be available on Canvas. Missing more than one class session may result in a grade reduction.

Course Assignments (due for use in class on the date listed)

Pre-assessment of student work	**April 16**
Cross-content observation slideshow	**May 14**
Lesson plan presentation	**June 4**

Meeting Times

Class will meet for 10 consecutive weeks on Tuesdays 3:15-6:00 in CERAS 308; April 2-June 4, 2018

Grading

Our expectation is that everyone will achieve mastery of the material taught in the course. To that end, we will invite you to revise and resubmit assignments in a timely manner if mastery is not the outcome upon the first submission. The other major component of the grade is participation and engagement during class time. Please read each week's reading carefully and fully before coming to class and have it readily accessible during each class. Because of your edTPA, job search, and independent student teaching in the spring, we have limited the readings significantly (typically only one per week or two shorter pieces each week) to ensure that this elective is manageable considering all of your other obligations in the spring. Assignment extensions may be granted by your instructors, if requested. Late work that is submitted without an extension may be subject to a grade reduction.

Students with Documented Disabilities

Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Office of Accessible Education (OAE). Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations.

Honor Code

1. The Honor Code is an undertaking of the students, individually and collectively:
   a. that they will not give or receive aid in examinations; that they will not give or receive unpermitted aid in class work, in the preparation of reports, or in any other work that is to be used by the instructor as the basis of grading;
   b. that they will do their share and take an active part in seeing to it that others as well as themselves uphold the spirit and letter of the Honor Code.
2. The faculty on its part manifests its confidence in the honor of its students by refraining from proctoring examinations and from taking unusual and unreasonable precautions to prevent the forms of dishonesty mentioned above. The faculty will also avoid, as far as practicable, academic procedures that create temptations to violate the Honor Code.
3. While the faculty alone has the right and obligation to set academic requirements, the students and faculty will work together to establish optimal conditions for honorable academic work.

Violations of the Honor Code

Examples of conduct that have been regarded as being in violation of the Honor Code include:

- Copying from another's examination paper or allowing another to copy from one's own paper
- Unpermitted collaboration
- Plagiarism
- Revising and resubmitting a quiz or exam for regrading, without the instructor's knowledge and consent
- Giving or receiving unpermitted aid on a take-home examination
- Representing as one's own work the work of another
- Giving or receiving aid on an academic assignment under circumstances in which a reasonable person should have known that such aid was not permitted

COURSE CALENDAR

Date	Topic	Readings for this class
Day 1: 4/2	**Introductions** - How is scientific thinking different? - How are the current science standards organized and how do you read them?	Osborne, J. (2011). Science teaching methods: a rationale for practices. School Science Review, 93(343), 93-103. How to Read the Next Generation Science Standards. Video resource http://www.nextgenscience.org/resources/how-read-next-generation-science-standards Additional Resource/Reference: A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Chapters 2 and 3. Safety Guidelines in Science Classes. www.nsta.org/safety
Day 2: 4/9	**Why teach Science?** - How have the opinions of teachers and society changed over time and changed our focus on how and what to teach in science classrooms?	Wysession, Michael. Why schools should teach science like sports. Scientific American. August 1, 2105 DeBoer, G.E. (2000) Scientific Literacy: Another look at its historical and contemporary meanings and is relationship to science education reform. Journal of Research in Science Teaching, 37(6), 582-601. Additional Resource/Reference: Why is Science Important? Website http://whyscience.co.uk/ Action Verbs for Writing Objectives
Day 3: 4/16	**Asking Questions: Context in Science** - What do students wonder about science in their everyday lives? - How does where we are and what we already know effect our learning in science? -How do we choose effective phenomenon? Assignment Due: Pre-assessment of student work.	Barton, A. C. (2002). Urban science education studies: A commitment to equity, social justice and a sense of place, Studies in Science Education, 38(1), 1-37. (Pretty long – skim if needed) The Right Questions. By Dan Rothstein and Luz Santana. Educational Leadership. NPR Story: How Helping Students To Ask Better Questions Can Transform Classrooms. Published 5/21/18 Additional Resource: Phenomenon for NGSS Website https://www.ngssphenomena.com/ Using Phenomenon in NGSS – linked, from the NGSS website Brown, J.; Collins, A.; and Duguid, P. (1989) Situated Cognition and the Culture of Learning. Educational Researcher, 18, 32-41.
Day 4: 4/23	**How does it all fit together? Cross cutting Concepts and Disciplinary Core Ideas:** - How are the 3 dimensions of science woven together to make a stronger science education? - Why is it important to know the wrong answers? or How can you find the right in the wrong answers? -What is the role of backwards planning in	A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Peruse Chapter 4: Dimension 2 Cross Cutting Concepts NPR Story: Why Teachers Need to Know the Wrong Answers? And review the section of the chapter of the recently adopted CA State Science standards that you are most interested in.

	science?	Chapter 7 (chapter 5 is middle school) The Living Earth pg 11-122 Chemistry in the Earth System pg 123-219 Physics in the Universe pg 220-343
Day 5: 4/30	**Language and Literacy in Science:** - How do we support the development of scientific literacy? - What are some reading strategies we can use to support our students as they read scientific text? - What are the 'talk moves' and how can we utilize them in our classroom?	Brown, B. A., & Ryoo, K. (2008). Teaching science as a language: A "content-first" approach to science teaching. Journal of Research in Science Teaching, 45(5), 529-553. Talk Science Primer Additional Resources: SERP Website, Reading to Learn in Science Norris, S. P., & Phillips, L. M. (2003). How literacy in its fundamental sense is central to scientific literacy. Science education, 87(2), 224-240. Wellington, J. & Osborne, J. (2001) Language and Literacy in Science Education. London, UK: Open University Press Burnett, Veronica. (2018) Edsurge. How the 5 E Model Makes Science Meaningful for Bilingual Students
Day 6: 5/7	**Defining Problems and Designing Solutions: What is Design Thinking in Science?** - What types of problems can we solve with science and engineering? - How can we facilitate activities for answering a scientific question or proposing a solution to a problem?	Lahey, Jessica. How Design Thinking became a buzzword at school. The Atlantic. January 4, 2017. https://www.theatlantic.com/education/archive/2017/01/how-design-thinking-became-a-buzzword-at-school/512150/ Morrison, Debbie. Why 'Design Thinking' doesn't work in education. Online Learning Insights. August 6, 2013. https://onlinelearninginsights.wordpress.com/2013/08/06/why-design-thinking-doesnt-work-in-education/ Design Thinking for Educators Website https://designthinkingforeducators.com/
Day 7: 5/14	**Modeling and Interpreting Data:** - What is considered a model in science? - When do we interpret data in real life? What counts as data? Assignment Due: Cross Content Observation	Schwarz, C. V., Reiser, B. J., ... (2009). Developing a learning progression for scientific modeling: Making scientific modeling accessible and meaningful for learners. Journal for Research in Science Teaching. 46(6), 632-654. Modeling: Allowing Students to Show What they Know. Tools for Ambitious Science Teaching. Windschitl, Mark and Jessica Thompson. The Modeling Toolkit: Making Student Thinking Visible with Public Representation. Science Teacher, January 2013.
Day 8: 5/21	**Discourse and Argumentation:** - Why argumentation and why in science? - Why is it important to look at misconceptions and to talk in science?	Osborne, J. (2010). Arguing to Learn in Science: The Role of Collaborative, Critical Discourse. Science, 328, 463-466. TedED: Derek Muller, The founder of Veritasium. Video series. http://ed.ted.com/on/rTahZlkM#watch Additional Resources: Hanford, Emily. American Radio Works. Don't Lecture Me. Fall 2011. http://americanradioworks.publicradio.org/features/tomorrows-college/lectures/ Chin, C. (2006). Classroom interaction in science: Teacher

		questioning and feedback to students' responses. International journal of science education, 28(11), 1315-1346. The Argumentation Toolkit
Day 9: 5/28	**Science and Society:** - What is going on with science and society? - When do we think about science and how does this connect to scientific literacy and why it would be important? - Where do people learn science outside the classroom?	Falk, J., & Dierking, L. (2010). The 95 Percent Solution: School is not where most of Americans learn most of their science. American Scientist, 98, 486-493. Vedantam, Shankar. NPR. March 14, 2017. Why piling on facts may not help in the battle against fake news. (audio news story) Additional Resource: Lucas, A. M. (1983). Scientific literacy and informal learning. 1-36.
Day 10: 6/4	**Lesson Plan Project Sharing** **Assignment Due: Final lesson project**	Refer to assignment sheet for lesson plan enactments