

EDUC267F:

Development of Scientific Reasoning and Knowledge II

Stanford University, Winter 2020

Friday January 10, 17, 24, 31, February 7, 12:30-3:15; Wednesday Feb 12, 2:30-5:15

Instructors

Polly Diffenbaugh
Office: CERAS 313, 650-223-9421
pdiffenbaugh@stanford.edu
Office Hours: By appointment

Greses A. Perez-Joehnk
Office: CERAS 225, 787-205-4119
greses@stanford.edu
Office Hours: By appointment

Course Description:

Development of Scientific Reasoning and Knowledge II is the second of two courses you will take to investigate aspects of science in the elementary classroom. We endeavor to work with you to continue to develop your competence and confidence to teach science. We will be emphasizing: 1. The use of phenomena as a method of exploring the world around us, and 2. Continuing to interpret the practices of the NGSS. We are excited to work with you to continue our exploration and ability to question what is happening around us.

Winter Quarter Goals

1. Analysis of existing curriculum in order to understand the structure and content of popular science curriculum materials that may be using in your jobs next year.
2. Practice the skills and strategies that we learned last quarter (productive talk moves, literacy strategies, see it-do it-write it, applying practices and CCCs, using models, asking questions) and include them in your plans.
3. Understand student's ideas about science topics (pre-assessments) to inform teaching and instruction.
4. Develop a lesson plan using a known curriculum, imbedded in a phenomenon, based on the needs of students (including special needs, linguistic and cultural needs.)

Grading Policy:

Our intention is that all teacher candidates will become more comfortable teaching science and in their own science understandings. Assignments which do not meet criteria will be returned for revision. Please communicate questions or concerns with Polly and Greses directly.

Assignments:

Class participation/attendance/readings/discussion questions

Please attend all classes. Please do all readings. Thank you!

CLASS ASSIGNMENT: Curriculum Study

This assignment will be completed throughout the quarter in class and in your respective placements. *Make sure that you document your thinking about it during the quarter.* The assignment consists of three major components that will be further explain during class:

1. Analysis of Curriculum Due Week 3

This assignment will be potentially completed with a partner who is teaching the same or a similar grade level as you. You will each turn an independent assignment at the end of the quarter. The goal of

this assignment is for you to explore some of the main curriculums available in schools right now and to share them with your classmates.

2. Video of your Students (~5-10 min) Due Week 5, Use Torsh Talent

The goal of this assignment is for you to practice talking about science with your students as a formative assessment strategy. This can be in the form of a science talk, students looking at data or a reading, students completing some sort of science activity or even interviewing a small group of students on the playground. We mostly just want to see and discuss some of what you might hear when listening to students talk about science. Ideally, you will use a portion of the curriculum you are investigating to help plan this video collection.

3. Lesson Plan based on Curriculum Due Week 6

Using any curriculum studied in our class or that is used in your school, take an existing lesson from that curriculum and modify it into a lesson plan that takes your students and their needs into account. Link your lesson plan to the NGSS and if possible, consider how you might also make it interdisciplinary. See provided template, or use your own format.

Outline of the project:

W1: Share and explore curriculum

W2: Make sense of a lesson

W3: Share your findings about the curriculum in your groups

W4: Choose a section of the lesson selected in W2 to record a video with students

W5: Video sharing and debriefing

W6: Write lesson plan with changes based on your learning

HONOR CODE:

Students are expected to adhere to Stanford's honor code. According to the Office of Judicial Affairs (OJA) website, "For purposes of the Stanford University Honor Code, plagiarism is defined as the use, without giving reasonable and appropriate credit to or acknowledging the author or source, of another person's original work, whether such work is made up of code, formulas, ideas, language, research, strategies, writing or other form(s)."

For further information, please consult the OJA website:

<http://www.stanford.edu/dept/vpsa/judicialaffairs/students/plagiarism.sources.html>

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). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is made. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 723-1066, URL: <http://studentaffairs.stanford.edu/oea>).

Detailed Session Information with Readings Included:

SESSION I: Friday January 10

Essential questions/Goals for the day: How can students use models to explain phenomenon and how can we employ them effectively in our classrooms?

Equity Focus: How prior knowledge may influence the way students react to new content?

Science Focus: Moon phases and seasons (content), challenges and benefits of using modeling in the classroom (strategies)

Readings:

Passmore, C., Schwarz, C. and Mankowski, J. (2017) Chapter 6: Developing and Using Models. Helping students make sense of the world using next generation science and engineering practices, 109-134

Assignment work for today:

W1: Share and explore curriculum - Form curriculum groups using the following curriculum choices: FOSS, Engineering is Elementary, CEEI, Amplify (grade 3), Mystery Science, NGSS Storylines

SESSION 2: Friday January 17

Essential questions/Goals for the day: Where are we now? What is phenomenon based teaching and how can we go about it?

Equity Focus: How does using a phenomenon-based approach help to support all learners? What does sensemaking look like in culturally relevant teaching? How can I support culturally and linguistically diverse students in my science classroom?

Science Focus: Light and sound (content), Modeling (strategies)

Readings

Bang, M., Brown, B., Calabrese-Barton, A., Rosebery, A. and Warren, B. (2017) Chapter 3: Towards a more Equitable Learning in Science: Expanding Relationships Among Students, Teachers and Science Practices. Helping students make sense of the world using next generation science and engineering practices, 33-58.

Content Background:

Robertson, W. Stop Faking it: Finally understanding science so you can teach it. [Light](#).

Robertson, W. Stop Faking it: Finally understanding science so you can teach it. Sound.

Books are available online at the Stanford library. Please review this content if you would like to.

Assignment work for today:

W2: Make sense of a lesson. Individually, but with your curriculum group, make sense of one of the lessons in the curriculum you chose.

SESSION 3: Friday, January 24

Essential questions/Goals for the day: How can I support the practice of engaging in data collection practices and conversations? How language and science learning can occur simultaneously?

Equity Focus: Engaging students in scientific discourse around data collection

Science Focus: ramps and momentum (content) and data collection conversations (strategies)

Readings

Michaels, S., & O'Connor, C. (2017). Chapter 14: From recitation to reasoning: Supporting scientific and engineering practices through talk. Helping students make sense of the world through next generation science and engineering practices, 311-336.

Content Background:

Robertson, W. Stop Faking it: Finally understanding science so you can teach it. [Force and Motion](#).

Assignment work for today:

W3: Share your findings about the curriculum in your groups

SESSION 4: Friday January 31

Essential questions/Goals for the day: How can students document thinking in engineering?

Equity Focus: Making diverse students' ways of knowing and thinking visible

Science Focus: Engineering and Electricity (content) and documenting thinking (strategies)

Readings

Cunningham, C. E. (2017). Chapter 13: Engineering practices. Helping students make sense of the world using next generation science and engineering practices, 283-307.

Content Background:

Robertson, W. Stop Faking it: Finally understanding science so you can teach it. Electricity and Magnetism.

Assignment work for today:

W4: Choose a section of the lesson selected in W2 to record a video with students

SESSION 5: Friday January 24

Essential questions/Goals for the day: Teaching content that might be controversial

Equity focus: Social justice in science education

Science Focus: climate change (content) and relevance of bringing social and scientific frames of thinking into science conversations (strategies)

Readings

Covitt, B., Dauer J. and Anderson, C. (2017) Chapter 4: The Role of Practices in Scientific Literacy. Helping Students make sense of the world using Next Generation Content Standards, 59-83. Focus on pages 72-78 using a climate change example

Busch, K.C., & Osborne, J. (2014) Effective strategies for talking about climate change in the classroom. School of Science Review, 96(354) 25-32.

Assignment work for today:

W5: Video sharing and debriefing

Session 6: Wednesday, February 12

Essential questions/Goals for the day: Learning from each other's experiences

Equity focus: Meeting the needs of diverse students (gender, ability, language, culture, etc.)

Science Focus: Panel of STEP science educators alumni and lesson sharing

Readings

No readings this week, before class please write some questions for our panel. We will work on them in class as well, but would like a starting point.

Submit class assignment today

Lesson plan sharing and discussion in class