EDUC267E:
Development of Scientific Reasoning and Knowledge I
Stanford University, Pre-Fall 2015
Tuesdays 8/18-9/15 4:00-6:00pm, 9/22-10/13 1:00-3:00pm CERAS 204

Instructors
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Office Hours: By appointment

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Office: CERAS 225
briand79@stanford.edu
Office Hours: By appointment

Course Description:
Development of Scientific Reasoning and Knowledge I is the first of two courses you will take to investigate aspects of science in the elementary classroom. It is our primary goal to help you to integrate science into your teaching and to begin to see it as the wonderful, all encompassing, fascinating subject that it is and can be. Our children are so interested in the world around them and they are fantastic question askers. We want to explore how we can facilitate this questioning and investigating of the world and to see what it looks like in our classrooms.

As we explore objects and phenomena, we will listen to ourselves describe, classify, explain, and predict in order to hear what scientific understanding sounds like. We will argue, use scientific models and write about our investigations as a model for what we can do with students. Our discussions will concern how teaching can foster such understandings in children and how all children can wonder, think about and ask questions about the world we live in and the phenomena they experience every day. Unfortunately, there are many students who are marginalized in science despite their interest and creativity, and/or are not given access to robust and rich science curriculum. Therefore, throughout this course, we will be focusing our lens on aspects of equity and how all students can engage in and access scientific content and practices.

In this class we will delve into the Next Generation Science Standards and the strong connections between them and the Common Core Standards in Math and Language Arts, particularly thinking about how we can support literacy in science. Additionally, we will focus on how you as teachers can build up your own content knowledge. The main assignments will be based on pre-assessments of your students in order to plan future instruction.

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 Brian directly.

Assignments:
Class participation/attendance/readings/discussion questions
Please attend all classes. Please do all readings. Thank you!

Reading Discussion Questions:
By Sunday night before each class (except class 1 and 7), please post a comment for the current week on the course Canvas site page, which includes a point you would like to make and a question you would like to discuss. You may also re-comment on other peoples' questions if you
would like. We will read comments and either use them as a basis for discussion or for other activities. We encourage you to return to the site and to reread each other's comments before class.

**ASSIGNMENT 1: Content Area Task (CAT) in Science**  
**Final Due Sept 29**
Parts due throughout the course, see syllabus for dates.
The goal of this assignment is to enable you to feel comfortable designing science learning objectives, to collect pre-assessment data about what your students already know about a science concept, to analyze that data to find patterns and define individual student needs and then to use that analysis to plan and design effective next steps to meet the specific needs of the students in your classroom. For the purposes of this class, full credit will be assigned for completing the CAT. Official CAT assessment will be completed through the PACT coordinator. If you have further questions, please see Colin Haysman, PACT Coordinator, CERAS 318, chaysman@stanford.edu.

**ASSIGNMENT 2: Practical Application of the CAT: Developing a Lesson Plan and Reflection**  
**Final Due Oct 13**
The goal of this assignment is to use the assessment data and analysis you generated in your CAT to actually design a lesson plan. It is not necessary to implement this lesson plan in your class, but we do find it a useful exercise to actually practice teaching science to kids. You will be provided with a set of guiding questions, but you may use any format you wish for the agenda and structure of the lesson plan.

**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](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/oae](http://studentaffairs.stanford.edu/oae)).

**SUGGESTED TEXT: (But mostly because we think it is a great reference for later)**
<table>
<thead>
<tr>
<th>Sessions</th>
<th>Questions/Goals for Today</th>
<th>Tasks/Class Activities</th>
<th>Readings/Questions</th>
<th>Assignments Due</th>
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| 1 Aug 18 | What is a scientist?      | 1. Unpacking the Scientific Practices  
How can we make scientific practices more authentic and inclusive?  
Equity: Access to science matters.  
To begin to unpack the scientific practices outlined in the NGSS.  
Watch Asking Questions/Designing Problems and Planning and Carrying Out Investigations |  |
| 2 Aug 25 | PRIOR KNOWLEDGE           | 1. Who do we know what our students know? Where did they develop that knowledge?  
2. Introduction to NSTA probes.  
3. Practice: Planning and carrying out investigations. What do seeds need to grow? Seed dissections.  
4. Assignment questions.  
| 3 Sept 1 | QUESTIONS AND DESIGNING INVESTIGATIONS | 1. Designing and planning investigations. How are your seeds? | Choose 1 of the following:  
1. Elstgeest, Jos. “The Right Question at the Right Time.” | CAT: In discussion with your teacher, choose an appropriate content |
<table>
<thead>
<tr>
<th>4 Sept 8</th>
<th>HANDS ON SCIENCE</th>
<th>What are we talking about? How can we use anchoring experiences that all students have and then build out from there?</th>
<th>Discuss context commentary and review big ideas.</th>
<th>Marx, P et al. Enacting Project-Based Science. <em>The Elementary School Journal</em>, Vol. 97, No. 4, Special Issue: Science (Mar 1997), pp. 341-358</th>
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<tbody>
<tr>
<td>CERAS 204</td>
<td></td>
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<td>Science</td>
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<td>Mini Lesson: PBL and who gets to do hands on science?</td>
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<td>Worktime: CAT</td>
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<td>CAT: Part 1: Identify Content and Develop Learning Objectives</td>
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<td>CAT: Part 2 Develop Rubric, rough draft</td>
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<td>Window to administer probe</td>
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<td>5 Sept 15</td>
<td>Field Trip to Jasper Ridge</td>
<td>HANDS ON VS FIELD BASED SCIENCE TEACHING?</td>
<td>Science: Ecology</td>
<td>Choose 2 of the following:</td>
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<td>Fukami, Tadashi. Integrating Inquiry-Based Teaching with</td>
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<tr>
<td>Date</td>
<td>Time</td>
<td>Location</td>
<td>Topic</td>
<td>Reading/Video</td>
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<td>8 Oct 6</td>
<td>1-3 pm</td>
<td>CERAS 204</td>
<td>SCIENCE AND WRITING&lt;br&gt;Why is it important to support and focus on literacy during science? What does it look like and how can we support it across the grade levels?</td>
<td>1. Writing in science. The science writing heuristic. Using evidence and claims to write scientific understandings.&lt;br&gt;2. Video: high quality science teaching&lt;br&gt;Science</td>
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<td>9 Oct 13</td>
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<td>CERAS 204</td>
<td>WRAPPING UP&lt;br&gt;Plans for next quarter. How to keep doing science?</td>
<td>Kirch, Susan and Anna Stetsenko. &quot;What does it mean to Know? Third grade students research</td>
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