

Secondary Science Methods
Spring 2013
Wednesdays from 5-8pm

Overview

As a second quarter of science methods, you will have the opportunity to refine your current understandings of teaching science to support conceptual understanding of content and the inquiry process from a Critical Social Justice perspective, situated in the Tacoma community.

Main goals

- ✧ Understand key concepts of *Conceptual Change* in science, and how to write lessons to support Conceptual Change through inquiry.
- ✧ Supporting discourse in the science classroom to elicit, develop and extend students' understanding and explanations of Big Ideas
- ✧ Learn more about the EOCs and SMPs to know the expectations of students' performance in science, as required by the state
- ✧ Gather textual, video, and computer model resources to support and supplement curriculum.
- ✧ Access and review resources to support afterschool educational experiences (including grant-writing)
- ✧ Learn about the opportunities, flexibilities and requirements within districts for using the text, taking kids outside, doing dangerous labs
- ✧ Examine current textbooks and make modifications. Examinations would include a critical look at the contents, representations in texts, opportunity for inquiry (including potential adjustments to make), set-up for conceptual change. How do teachers make decisions about skipping content, supplementing, scaffolding or removing scaffolds?
- ✧ Understand more about Teaching Science for Critical Social Justice, Community Based Education and Problem-based inquiry that includes authentic and meaningful inquiry projects that have real audiences.

A few additional notes and questions

- ✧ Are you a member of NSTA?
- ✧ NGSS should be coming out this spring!

Syllabus Schedule

Week	Focus of Session	Readings and Assignments
	Join NSTA!	<p>We will be making significant use of a website: Tools for Ambitious Science Teaching. This website has documents, tools, and video footages with teachers and in classrooms. The work done by Windschitl and Thompson represent some of the best thinking in Ambitious Science Teaching Practices that have been developed with our Critical Social Justice perspective in mind. There is more to explore with TCSJ, but with respect to excellent teaching – this is powerful!</p> <p>As we work through these materials, select a set of case studies from your area of science. Watch associated video each time we dig in to a segment.</p>
<p>Kat, Bri and Tori – I apologize for frontloading week 1. I had distributed things a bit better, but you will be much better prepared for your instructional strand on Saturdays by getting a leg up on Wednesdays before hand. You will kick me now and thank me later.</p>		
1	<p>Discourse in Science: Eliciting students' ideas</p> <p><i>Let's also discuss: How would you like to share your work with each other? Do you want to share lesson plans, create a moodle spot for this ...?</i></p> <p><i>Bri – share your ideas and plans about preparing students for the EOCs with the group.</i></p>	<p>Download and prepare: tools4teachingscience.org/</p> <p>The Big Idea Primer & The Big Idea Tool Read the Primer. Then identify a topic (as described) and use The Big Idea Tool to create a Big Idea with an explanatory model. (You could choose this topic from your Week 7 teaching, or what you will be teaching on Saturday mornings.) Look at your case study example of the big ideas.</p> <ul style="list-style-type: none"> Please email Anita with your topics by Tuesday morning, April 2nd so she can better prepare for class. <p>Then prepare from the same source: The Discourse Tools #1. View associated video of Discourse in your Case Study.</p> <p>Turn in: Your Big Idea development revised after your conversation in class. Apply the discourse strategy for Saturday Week 1 instruction!</p>

Week	Focus of Session	Readings and Assignments
2	<p>Understanding Conceptual Change and the nature of Big Ideas</p> <p>Cranking up the Intellectual work – working with Students’ Schema –not yours</p>	<p>Read and prepare for discussion: Bransford: How people learn science Ch. 9; Scientific Inquiry and How People Learn</p> <p>Download and prepare: The Discourse Tools #2. Making sense of material activity. Prepare this element and bring your work ready to dig into. View associated video of Discourse in your Case Study.</p>
3	<p>How can we use discussion to help students develop evidence-based explanations?</p> <p>Teaching Science for Critical Social Justice</p>	<p>Read and prepare for discussion: Bransford: How people learn science Ch. 11 & 12 (Divvy up the chapters among you. Come to class with a summary of key ideas and be prepared to teach your colleagues about the chapter.)</p> <p>Download and prepare: The Discourse Tools #3. Pressing Students for Evidence Based Explanations. Prepare this element and bring your work ready to dig into. View associated video of Discourse in your Case Study.</p>
4	<p>Digging deeper into Equitable teaching practices for science</p>	<p>Read and prepare for discussion: Diversity and Equity in Science Education: Research, Policy, and practice. Multicultural Education Series, Ohkee Lee and Braxton (Chapters 3 & 4)</p> <p>Turn in: Interviews</p>
5	<p>Examining texts for opportunities to develop Big Ideas through High Leverage Teaching Practices</p>	<p>Read and prepare for discussion: Diversity and Equity in Science Education: Research, Policy, and practice. Multicultural Education Series, Ohkee Lee and Braxton (Chapter 5)</p> <p>Bransford Ch. 13 – Revisiting 3 principles</p>

Week	Focus of Session	Readings and Assignments
6	<p>Assessments: EOCs, MSPs, the future and formative assessment</p> <p>What is The Nature of Science? Why is this important for students to know? How might you include these concepts in your teaching? Why is this part of Teaching for Critical Social Justice?</p>	<p>Read and prepare for discussion: Diversity and Equity in Science Education: Research, Policy, and practice. Multicultural Education Series, Ohkee Lee and Braxton (Chapter 6)</p> <p>Bring: Keeley’s formative assessment book</p> <p>Download and read: prepare for discussion http://www.project2061.org/publications/sfaa/online/chap1.htm http://www.nsta.org/about/positions/natureofscience.aspx Examine the VNOS</p> <p>Turn in: Lesson plans focused on Inquiry and TCSJ</p>
7	No Class – Teaching in Practicum	
8	<p>Understanding the Framework for k-12 science Education (with a focus on Engineering design and technology.</p> <p>What are the NGSS requirements for technology?</p>	<p>Read and prepare for discussion: Download and look over The Framework for k-12 Science Education (a 385 page document). Look at the major headings. Identify an area that you think is important to know and that you are not currently well aware of it. Read it. Peruse other parts of the document.</p> <p>Diversity and Equity in Science Education: Research, Policy, and practice. Multicultural Education Series, Ohkee Lee and Braxton (Chapter 7)</p> <p>Geomap ap (see Tori) Sealevel.newscientistapps.com (NSTA website) Articles on Science simulations on computer http://www.nap.edu/openbook.php?record_id=13165&page=1</p>
9	<p>Resource Festival</p> <p>Opening up STEM for students</p>	<p>Read and prepare for discussion: Diversity and Equity in Science Education: Research, Policy, and practice. Multicultural Education Series, Ohkee Lee and Braxton (Chapter 8) Everyone spend time digging up resources that include texts, videos, materials...</p> <p>Read pdf from Moodle Ten science facts and fictions: The case of early education and STEM careers</p>

Week	Focus of Session	Readings and Assignments
10	Science Fairs and extracurricular opportunities & constraints/ opportunities in your teaching (leaving the classroom, fieldtrips, using textbooks) Garnering resources, writing grants	<p>Read and prepare for discussion: Diversity and Equity in Science Education: Research, Policy, and practice. Multicultural Education Series, Ohkee Lee and Braxton (Chapter 9)</p> <p>See below - Robotics</p>

Major assignments

Interview Plus: Three Interviews testing the Big Ideas and discourse principles (preferably the one you'll be working with in your 3-day teaching or unit plan) (Due Week 4)

This “interview plus” builds off of what you did fall quarter, but moves into the territory of eliciting students’ conceptions on Big Ideas. Begin by reading a research article or other source of information that identifies key scientific misconceptions. Using the Big Ideas and Discourse 1 principles of eliciting students’ ideas, create an interview that will elicit someone’s conceptions about that important idea. Capture these interviews on video so that you can pay closer attention to what they and you are saying rather than trying to record everything in writing during the interview.

The “plus” part of this interview is to move you further into teaching for Conceptual Change. When a person has a misconception, your job, as a teacher, is to pose a question that should challenge that conception. But this needs to be done in such a way to invite the person into thinking about this dilemma. It is different from a “gotcha” stance that you might grin and say, “yeah – well what about this?” The question you pose back would be more like, “as you think about (what you just said), how do you think it affects XYZ?” or “how do you think this other thing works?”

The purpose of these “plus” questions is to cause disequilibrium for the student, so that they are wondering –hmmm, perhaps I don’t have this all figured out. I want to understand this now! So move them in to that disequilibrium.

You want this process to become natural to you, and part of a comfortable conversation with students. It is largely the work you will do with students as they develop and carry out

inquiries/explorations/"labs." Your role during those explorations is to help students modify their schema to create more accurate conceptions of scientific ideas.

Submission should include:

1. A brief summary of the research from which you based your interviews
2. A list of your prepared interview questions
3. Claims about what students understand and what are their partial conceptions.
4. Evidence of students' responses (notes, drawings, portions of transcripts, video clips) that link directly to your claims about what they understand.
5. Analysis of your interview, the effectiveness, and what changes you would like to make next time.

My feedback will focus on:

- your prepared and spontaneous questions and their effectiveness at accessing students' ideas
- Your claims about students' understandings, and the degree to which you explained what they understood
- Your clarity in tying claims to evidence
- The effectiveness of your self-analysis – how well you are noticing elements of your interviews for eliciting students' ideas

Lesson plans focused on inquiry and TCSJ (Lesson plans around a Big Idea)(Due week 6)

You need to develop skill in modifying existing curriculum that includes labs as recipes – and shift them to explorations around Big Ideas where students are intellectually engaged and using evidence to devise explanatory models. Unfortunately, all too many science materials, including Foss kits, are more about recipes than inquiry around Big Ideas. You also need to develop your skills at including community-based inquiries or other elements of Critical Social Justice.

This may be 3-6 days of lesson plans. Make this both valuable for you and reasonable.

Submission

- ★ Include original materials (not 50 pages, but 3-10 pages)
- ★ Provide some kind of indication as to where you made modifications. This may be by using post-it notes in the original materials with a coding scheme in your lessons to show where you made the shifts
- ★ Consider making minor shifts rather than major shifts when possible. While major shifts can be much better and potentially more engaging for kids, your daily reality of teaching requires that you develop some quicker routines for "inquirifying" lessons. You will not have 40 hours to prepare 3 days of lessons, usually.
- ★ Please do not only work on one element of a lesson plan. Each lesson plan needs to continue to include *language demand, accommodations, Student Voice, etc.*

My feedback will focus on:

- Evidence of your understanding of teaching to Big Ideas
- Evidence of your readiness to support students' intellectual engagement

A portfolio that is useful for you (Share with Anita on Saturday week 9)

- * Supplemental resources (videos, books, journals...)
- * Sample lessons that are inquiry based (that may be developed as part of the instructional strand and/or interdisciplinary curriculum development)
- * Clear notes on key ideas of the quarter that you can use for reference (talk with me if this messes up a current system)
- * Approaches to problem-based instruction
- * Approaches to Teaching for Critical Social Justice, including Community –based inquiry
- * Formative Assessment Strategies

Readings

Downloadable Chapters:

How Students Learn: Science in the Classroom

M. Suzanne Donovan and John D. Bransford, *editors*, Committee on How People Learn: A Targeted Report for Teachers, National Research Council

ISBN # 0-309-54807-1

Book

Lee, O., Buxton, C. (2010). Diversity and Equity in Science Education: Research, Policy, and practice. Multicultural Education Series

These will be part of the curriculum work:

Empowering Science and Mathematics Education in Urban Schools by Angela Calabrese Barton, Edna Tan, Erin Turner and Maura Varley Gutierrez (Aug 15, 2012)

Science Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning / Edition 1

by Page Keeley

Resources

Science Literacy <http://strandmaps.nsdl.org/?chapter=SMS-CHP-0857>

Safety in Science: <http://www.nsta.org/portals/safety.aspx>

Computer simulations: Downloadable pdf

Science Teaching and Learning

Randy L. Bell and Lara K. Smetana

Science Fairs and Extracurricular STEM

Puget Sound Energy

- futurecity.org/
- <http://www.wssef.org/>
- http://www.eurekamasons.org/resources_websites.htm