EDUC 830 – SCIENCE EDUCATION AND SCIENCE STUDIES: INTERSECTIONS
Wednesdays; 9:00 a.m. – 12:00 p.m.
Room: Educational Studies Conference Room (4th floor by the kitchen)

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Office: #4047
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734-647-2975 (office phone)
Office Hours: by appointment

Canvas: Log onto the Canvas site (http://umich.instructure.com). I will use this site to post all course materials (e.g., weekly reading, handouts, assignments). You will use this site to post to submit assignments, etc. It is your responsibility to check the Canvas site regularly. Please let me know if you do not have regular Internet access.

COURSE DESCRIPTION
“Science & Technology Studies (STS [science studies]) is a dynamic interdisciplinary field, rapidly becoming established in North America and Europe. The field is a result of the intersection of work by sociologists, historians, philosophers, anthropologists, and others studying the processes and outcomes of science, including medical science, and technology. Because it is interdisciplinary, the field is extraordinarily diverse and innovative in its approaches. Because it examines science and technology, its findings and debates have repercussions for almost every understanding of the modern world” (p. vii).

-- Sergio Sismondo from An Introduction to Science and Technology Studies (2nd ed.) (2010)

“From its inception, one of the principal goals of science education has been to cultivate students’ scientific habits of mind, develop their capacity to engage in scientific inquiry, and teach them how to reason in a scientific context…there has always been a tension, however, between the emphasis placed on developing knowledge of the content of science and the emphasis placed on scientific practices. A narrow focus on content alone has the unfortunate consequence of leaving students with naïve conceptions of the nature of scientific inquiry…and the impression that science is simply a body of isolated facts…” (p. 41).


Course Overview
Inquiry has always been an important aspect of K-12 science education (and beyond). However, the term “inquiry” is interpreted many different ways, to the point that it is unclear what is meant by that term in any given context and with respect to specific science learning and teaching experiences and practices. In an attempt to clarify to the science education community the meaning of the term “inquiry,” the National Research Council’s Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012), and the Next Generation Science Standards (NGSS;
NGSS Lead States, 2013) call on science educators to engage students with specific scientific practices (e.g., modeling, constructing and interpreting evidence-based explanations and arguments, collecting and analyzing data). One rationale for engaging students with these practices is that students should be doing the type of work that scientists and engineers do so that their science learning experiences are more “authentic.” The Science Studies literature – a body of literature detailing research on the scientific enterprise (conducted using a variety of methodological perspectives, and within a variety of academic fields and traditions) – has much to say about how we as science educators can understand these practices. In addition, the Science Studies literature is instructive with respect to a variety of other issues that scholars in Science Education explore (e.g., teaching science through scientific controversies, feminist perspectives on science and learning science, public understanding of science and public participation in science).

In this course, we examine some of the intersections among various aspects of the Science Studies literature and literature in Science Education. In light of these literatures, we will interrogate federal and state goals for K-12 science education (which are certainly applicable to K-16 science education as well). We will explore different philosophical perspectives related to lenses on scientific work (e.g., realism, instrumentalism, feminism), and we will deconstruct current policies and practices in science education to interpret which philosophical perspectives might be underlying current science education systems (and why that might matter). We will also discuss the implications of Science Studies literature for science education research.

The course is divided into two parts. Part I explores the intersections discussed above with respect to scientific practices. Part II explores the intersections discussed above with respect to other issues of interest (e.g., scientific controversies). The following questions will guide our work together throughout the course (these are listed in no particular order):

1. What images of scientific practice are evident in science education materials, popular media, scientists’ reflections on their work, and public communication of science?
2. What current trends in science education (with respect to curriculum, instruction, assessment, undergraduate education, etc.) might we question, research, choose to revise, etc. given science studies literature?
3. What intersections among literatures in philosophy of science, rhetoric of science, sociology of science, history of science, anthropology of science, and the like, and then science education, seem to be most useful for OUR science teaching, learning, design, and/or research? How do we define “useful” (and useful for whom)?

COURSE POLICIES AND PROCEDURES
This is a seminar-style course, with an emphasis on analysis of text, thorough and thoughtful in-class discussion, and out-of-class explorations related to course themes. Given the sheer breadth of the applicable literatures, it should be quite clear that a 14-week course will not ensure that course participants are “expert” with respect to the intersections of the science studies and science education literatures. However, through course readings, discussions, writings, and explorations, course participants should have a much more detailed understanding of these intersections, and how they might be useful with respect to their thinking and their work.

Bricker – EDUC 830 – Fall 2016
Course Evaluation
Grades are based on total points earned. No curve is used. In addition, I do not give grades of A+ in graduate-level courses (because no one is going to be “expert” with respect to any of these ideas, practices, and the like after one, 14-week course). The course grading scale is as follows:

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<thead>
<tr>
<th>Percent Range</th>
<th>Corresponding Grade</th>
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<tbody>
<tr>
<td>94% - 100%</td>
<td>A</td>
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<tr>
<td>90% - 93%</td>
<td>A-</td>
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<td>88% - 89%</td>
<td>B+</td>
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<tr>
<td>84% - 87%</td>
<td>B</td>
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<tr>
<td>80% - 83%</td>
<td>B-</td>
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<tr>
<td>78% - 79%</td>
<td>C+</td>
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<tr>
<td>74% - 77%</td>
<td>C</td>
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<td>70% - 73%</td>
<td>C-</td>
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<tr>
<td>68% - 69%</td>
<td>D+</td>
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<td>64% - 67%</td>
<td>D</td>
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<tr>
<td>60% - 63%</td>
<td>D-</td>
</tr>
<tr>
<td>Below 60%</td>
<td>F</td>
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</tbody>
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NOTE: See “Course Assignments and Projects” for a list of course assignments and their accompanying points.

Additional Policies and Expectations
1. Academic and Professional Integrity
It is expected that all members of this learning community will conduct themselves with integrity related to all aspects of our academic and professional lives. This includes making certain that plagiarism never occurs. If you are unsure about how to correctly attribute ideas, words, work, etc. to others, please ask. Please refer to the following website for specific policies and procedures related to academic and professional integrity: [http://www.soe.umich.edu/file/academic_integrity/](http://www.soe.umich.edu/file/academic_integrity/)

2. Accessibility
Every member of this learning community has the right to full participation. If you need an accommodation(s) for any type of disability, please let me know at your earliest convenience. We can work with Services for Students with Disabilities ([http://ssd.umich.edu/](http://ssd.umich.edu/)) to ensure that your learning is fully supported. I will, of course, keep our discussions private and confidential.

3. Discrimination/Harassment
No member of this learning community should be subject to discrimination of any kind and/or harassment. Please refer to the following websites for University policies related to discrimination and harassment:
[http://spg.umich.edu/policy/201.89-1](http://spg.umich.edu/policy/201.89-1)
[http://www.rackham.umich.edu/current-students/help/discrimination](http://www.rackham.umich.edu/current-students/help/discrimination)
4. **Diversity, Inclusion, Justice, and Equity**

As you know, the University of Michigan School of Education is guided by twin imperatives, as we call them: a focus on education practice (writ large) and a commitment to diversity, inclusion, justice, and equity. In this course, we will explore how these twin imperatives currently surface in science education specifically, and what this might mean for OUR practice (e.g., teaching, scholarship, partnerships) moving forward.

5. **Classroom Community**

Our work together relies on honest, open, and respectful dialogue so that all participants feel free to express their views and ask questions. Disruptive behavior (e.g., inappropriate language, talking over others, harassing others) has no place in our course and will result in the loss of participation points at the very least. Here are a few guidelines to help facilitate our conversations and activities each week:

a. *There is no such thing as a stupid question.* Please ask any and all questions that you have and remember that by asking your questions, you are allowing us to learn as a community because you are helping to make ideas visible.

b. *Be respectful of others’ ideas and experiences* even if they are different from your own. We do not have to agree but we do owe it to each other to listen to and consider each other’s points of view. On a related note, please *respect confidentiality* related to this course.

c. *Listen to others* by trying not to interrupt until whoever is talking is finished and until you have heard and considered what others have said. *Do not assume that silences are unproductive.* Give others time to think, consider, and formulate ideas.

b. *Monitor your participation.* If you are outgoing and tend to dominate conversation, use this course as a chance to practice allowing others a space to participate. If you are less outgoing and tend to let others do the talking, use this course as an opportunity to practice speaking up and adding to the conversation.

c. *Please turn cell phones off or to vibrate* before each class session out of respect for our community. On a related note, *use laptops appropriately* (e.g., note taking, presentations). Unless directly related to this course, please *refrain from texting, visiting Facebook, etc.* Please *turn off all MP3 players.* Please be mindful of your technology use because it can be quite offensive to others if they are speaking and you are texting or checking email.

6. **Attendance, Participation, and Communication**

Regular, on-time attendance and thoughtful participation during class discussions and other activities are essential not only to your individual performance but also to the success of the course and our community. We all share responsibility for the learning and teaching in this course. Because you will not be able to participate in the class community if you are not present, *absences will result in the loss of participation points,* except in cases of extreme circumstances (e.g., family emergency, illness). If you know that you have to miss a class session, *please notify me PRIOR to your absence.* You are responsible for obtaining all materials (including summaries of class activities and discussions) and making up any missed work. *I expect excellent communication* (e.g., notifying me prior to any absence, notifying me about any issues regarding assignments).

7. **Late Work, Extension Requests, and Revisions**

**LATE WORK:** Unless I state otherwise, all assignments are due on the dates listed in the syllabus. You may submit your work via email to me directly, and/or by uploading it to the course’s Canvas site.
EXTENSIONS: I understand that we are all busy people and sometimes we are not able to adhere to stated due dates. If you need an extension, please talk with me in person or contact me via email. **Make sure you contact me PRIOR to any given due date** or I may not be able to grant your extension request. Please do not abuse my liberal extension policy.

REVISIONS: You may revise and resubmit assignments that you submitted on time (this policy does not apply to late work unless I have granted you an extension). Should you find yourself in this situation, I will give you detailed instructions about how to revise your work. I will expect that you take account of my feedback when creating your revisions.

8. **Format for Assignments & Assignment Submission Guidelines**

Unless I note otherwise, all assignments must be typed. **Please double-space your work, use 1” margins all around, and use 12 point Times New Roman font.** As with all assignments, I expect you to attend closely and carefully to spelling, grammar, and other conventions. When referencing course and other materials, please follow the American Psychological Association style guidelines (APA – 6th edition). You can access the APA style manual through University of Michigan’s libraries or online at [http://www.apastyle.org](http://www.apastyle.org). Purdue University also has a very helpful online APA guide: [http://owl.english.purdue.edu/owl/resource/560/01/](http://owl.english.purdue.edu/owl/resource/560/01/)

**COURSE ASSIGNMENTS**

**NOTE:** More information (i.e., detailed assignment guidelines with evaluation criteria) will be posted to the Canvas site in a timely manner, and discussed in class.

1. **Participation – ~4 points per class session; 50 points total – ~10% of final course grade**

   **Due Date: Rolling throughout the semester**

   You are expected to participate in all aspects of this course. Participation will take many different forms throughout the semester. For example, I might ask you to bring questions to class, design an activity that relates to the readings, and find web sites and other resources to share. You are expected to come to class having already done the readings and ready to participate in discussions and other activities. I want to see you sharing your expertise, debating various perspectives, questioning ideas and arguments, and proposing practical applications for the ideas we are exploring.

2. **Lead Two Class Discussions – 25 points each – ~10% of final course grade**

   **Due Date: Rolling throughout the semester**

   In order to distribute the responsibility in the course for facilitation, you will lead two class discussions related to the readings during two weeks of your choosing.

3. **Scientific Practice Observation and Informal Interview – 100 points – ~20% of final course grade**

   **Due Date: October 5**

   In order to concretize some of the course themes and readings, you will conduct a series of observations within a science-related setting (e.g., working laboratory [university or industry], laboratory section of a course on campus, school science classroom, science museum). As part of your observations, you will also conduct an informal interview with someone in your chosen setting.
4. Artifact Analysis – 100 points – ~20% of final course grade  
*Due Date: November 2*

Again, to concretize course themes, you will analyze an artifact, using course readings, course focal questions, and discussions. This might be a book written by a scientist about his/her work, a film(s) with a science related theme, a curriculum that purports to have a “Nature of Science” emphasis, a science-related video game, a museum exhibit(s), etc.

5. Final Course Project – 150 points – ~30% of final course grade

Your final course project should be directly applicable to your current work (or future work that you would like to do). For example, it might be that a literature review, using some aspect of the course, would be most useful to you (e.g., you might choose to explore the area of science studies most aligned with your research interests to begin to search for synergies). It might be that designing and developing an aspect of curriculum or a course, using course themes, might be most applicable to you. It might be that designing a research study, guided by some aspect of the course, is most applicable to you. You might choose to conduct a journal review to explore publications over the past several years related to course themes. Because this is a small seminar, each course participant will meet with me individually to determine his/her final course project, and its accompanying requirements. The following due dates and related points values will guide final project work:

-- Meet with me about your final project idea(s) (meeting to take place no later than Oct. 19; 10 points)
-- Final Project Outline (due Nov. 16; 40 points)
-- Final Project (due no later than Dec. 9; 100 points)

NOTE: You will have the opportunity to share final project ideas in class and receive feedback from your peers.

COURSE SCHEDULE*

*I reserve the right to revise this schedule whenever necessary and useful, and based on our progress in the course.

**WEEK 1 – SEPTEMBER 7, 2016 – COURSE INTRODUCTION & CURRENT GOALS FOR SCIENCE EDUCATION**

**READINGS:**

→ Chapter 2: Guiding Assumptions and Organization of the Framework
→ Chapter 3: Scientific and Engineering Practices
→ NOTE: You can download this publication (or specific chapters) for free (once registered) at: [http://www.nap.edu/catalog.php?record_id=13165](http://www.nap.edu/catalog.php?record_id=13165)

Peruse the *Next Generation Science Standards* (NGSS) at [http://www.nextgenscience.org/](http://www.nextgenscience.org/). Be ready to discuss how the ideas from the NRC’s *Framework* show up in the NGSS.

National Science Teachers Association (NSTA) position statement on the *Next Generation Science Standards*

**ASSIGNMENTS:**
1. Come to class next week (Sept. 14) with any questions you have about the syllabus.
2. Come to class next week ready to sign up for your reading-discussion facilitations. (We will talk next week about what is involved in facilitating a discussion and I will semi-model that.)
3. Begin to think about where you might want to conduct your observation(s) & interview(s) for the Scientific Practices assignment. (We will go over that assignment in detail next week.)

**WEEK 2 – SEPTEMBER 14, 2016 – WHAT IS SCIENCE STUDIES?**

**READINGS:**
- Preface and Chapter 1: The Prehistory of Science and Technology Studies
- Chapter 9: Two Questions Concerning Technology


- Read the Preface and Chapter 1 (New Citizens, New Societies: New Sciences, New Philosophies?)

**ASSIGNMENTS:**
1. Solidify your observation/interview site for your Scientific Practices assignment. This assignment is due on or before Oct. 15. NOTE: We will discuss your progress in class on Sept. 21st and 28th. You can use those discussions as opportunities to ask questions, seek advice, etc. before you finalize your work in preparation for the Oct. 5 deadline.
2. Schedule a time to meet with me about your final course project. This meeting must take place no later than Oct. 19.

**WEEK 3 – SEPTEMBER 21, 2016 – EXAMPLE “INTERSECTION” WORK IN SCIENCE EDUCATION**

**READINGS:**

**ASSIGNMENTS:**
1. Continue working on your Scientific Practices assignment. The assignment is due on or before Oct. 5.
2. If you haven’t already, set up a time to meet with me about your final course project. This meeting must take place no later than Oct. 19.
WEEK 4 – SEPTEMBER 28, 2016 – SCIENTIFIC PRACTICES: EVIDENCE-BASED ARGUMENTATION
GUEST SPEAKER: PROFESSOR PHILIP BELL; UNIVERSITY OF WASHINGTON

READINGS:
→ Chapter 13: Rhetoric and Discourse

ASSIGNMENTS:
1. Remember that your Scientific Practice assignment is due next week. Email me your final assignment or upload it to Canvas. Be ready to discuss your work in class.
2. If you haven’t already, set up a time to meet with me about your final course project. This meeting must take place no later than Oct. 19.
3. Start to think about what you might want to analyze for your Artifact Analysis assignment (due on or before Nov. 2). We will discuss the details of that assignment in class next week.

WEEK 5 – OCTOBER 5, 2016 – SCIENTIFIC PRACTICES: EXPLANATIONS

READINGS:

ASSIGNMENTS:
1. Last call: If you haven’t already, set up a time to meet with me about your final course project. This meeting must take place no later than Oct. 19.
2. Begin work on your Analysis assignment (due on or before Nov. 2). You will have opportunities in class on Oct. 19th and 26th to discuss your progress. You can use these opportunities to ask questions, seek advice, etc. before you finalize your work in preparation for the Nov. 2 deadline.

WEEK 6 – OCTOBER 12, 2016 – NO CLASS (INSTRUCTOR ABSENCE)

ASSIGNMENTS:
1. Continue working on your Analysis assignment (due on Nov. 2). Remember that we will be ready to give each other and feedback on this assignment next week and the week after so come to those classes with any questions, etc.
2. If applicable, begin aspects of your final course project.
WEEK 7 – OCTOBER 19, 2016 – SCIENTIFIC PRACTICES: MODELING
GUEST SPEAKER: PROFESSOR CINDY PASSMORE, UNIVERSITY OF CALIFORNIA DAVIS

READINGS:

ASSIGNMENTS:
1. Remember that your Analysis assignment is due on Nov. 2.
2. Your final project outline is due on Nov. 16.

PART II: OTHER TOPICS OF INTEREST

WEEK 8 – OCTOBER 26, 2016 – “THE NATURE OF SCIENCE”

READINGS:

ASSIGNMENTS:
1. Remember that your Analysis assignment is due next week. Be ready to discuss your analysis in class next week.
2. Continue working on elements of your final project. Your final project outline is due on Nov. 16. You will have opportunities in class to discuss your progress, ask questions, seek advice, etc., for the rest of the semester. Your final course project is due on or before Dec. 9.

WEEK 9 – NOVEMBER 2, 2016 – FEMINIST EPISTEMOLOGIES OF SCIENCE

READINGS:


→ Chapter 7: Feminist Epistemologies of Science

**ASSIGNMENTS:**

1. Continue working on elements of your final project. Your final project outline is due on Nov. 16. You will have opportunities in class to discuss your progress, ask questions, seek advice, etc., for the rest of the semester. Your final course project is due on or before Dec. 9.

**WEEK 10 – NOVEMBER 9, 2016 – SCIENCE CONTROVERSIES AND SOCIOSCIENTIFIC ISSUES**

**GUEST SPEAKER: PROFESSOR TROY SADLER, UNIVERSITY OF MISSOURI**

**READINGS:**


→ Chapter 11: Controversies

**ASSIGNMENTS:**

1. Continue working on elements of your final project. Remember that your final project outline is due next week. You will have opportunities in class to discuss your progress, ask questions, seek advice, etc., for the rest of the semester. Your final course project is due on or before Dec. 9.

**WEEK 11 – NOVEMBER 16, 2016 – SCIENCE COMMUNICATION AND SCIENTIFIC “LITERACY”**

**READINGS:**


ASSIGNMENTS:
1. Continue working on elements of your final project. You will have opportunities in class to discuss your progress, ask questions, seek advice, etc., for the rest of the semester. Final projects are due on or before Dec. 9.

**WEEK 12 – NOVEMBER 23, 2016 – ANTHROPOLOGY OF SCIENCE/STUDIES OF LABORATORIES**

**GUEST SPEAKERS: DR. ELYSE AURBACH (U-M RELATE) & MS. JESSICA STACHOWSKI (U-M CHEMISTRY AND A M.S. IN POST-SECONDARY SCIENCE EDUCATION STUDENT)**

**READINGS:**
→ Chapter 10: Studying Laboratories

**ASSIGNMENTS:**
1. Continue working on elements of your final project. Final projects are due on or before Dec. 9.

**WEEK 13 – NOVEMBER 30, 2016 – TBD**

**READINGS:**

**ASSIGNMENTS:**
1. Continue working on elements of your final project. Final projects are due on or before Dec. 9 by 5:00 p.m.

**WEEK 14 – DECEMBER 7, 2016 – WHY A FOCUS ON SCIENTIFIC PRACTICES?**

**READINGS:**
Four essays that focus on this question from *Science Education* (November 2015; Volume 99, Issue 6, pp. 1023-1054).

**ASSIGNMENTS:**
1. Final projects are due on or before Dec. 9 by 5:00 p.m.