EDUC 830 – INTERSECTIONS AMONG SCIENCE EDUCATION AND SCIENCE STUDIES
Mondays, 1:00 p.m. – 4:00 p.m.
Room 2346 SEB

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Office Hours: by appointment

CTools: Log onto the CTools site (www.ctools.umich.edu) with your uniqname and password. You will see a tab titled EDUC 830 001 F13. I will use this site to communicate with you, as well as post all course materials (e.g., weekly reading, handouts, assignments). You will use this site to post to forums, submit assignments, etc. It is your responsibility to check CTools regularly. Please let me know if you do not have regular Internet access.

COURSE DESCRIPTION
“Science & Technology Studies (STS [a.k.a. 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 not clear what anyone means by it 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; Achieve, 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). 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. After all, 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.” 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 practice. 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 throughout both sections of the course (these are listed in no particular order):

1. What are various productive intersections among literatures in philosophy of science, rhetoric of science, sociology of science, history of science, anthropology of science, etc., and science education?
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 images of scientific practice are evident in popular media, scientists’ reflections on their work, public communication of science, science education materials, etc.?

COURSE POLICIES
This is a seminar-style course, with an emphasis on close-reading 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 work.

Course Evaluation
Grades are based on total points earned. No curve is used. The course grading scale is as follows:
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<table>
<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>
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<td>84% - 87%</td>
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<td>80% - 83%</td>
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<tr>
<td>Below 60%</td>
<td>F</td>
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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 a 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, as these practices have no place in a just society. Please refer to the following websites for University policies related to discrimination and harassment: [http://urespect.umich.edu/report/what/#Report3](http://urespect.umich.edu/report/what/#Report3)  
   [http://www.rackham.umich.edu/policies/discrimination_harassment/](http://www.rackham.umich.edu/policies/discrimination_harassment/)

4. Diversity/Social Justice
   It is my intention to facilitate this course in ways that acknowledge and respect all aspects of diversity. This includes respect for ideas and practices related to gender, sexuality, disability, religion, age, socio-economic status, race, ethnicity, and culture. Not only must we have respect for each other relative to diversity but we must also examine how issues of diversity interact with course themes (e.g., feminist philosophy of science).
5. Classroom Community
Our work together relies on honest, open, and respectful dialogue so that all participants feel free to express their views. 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 both in the class and outside of it.

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.

d. **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.

e. **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.

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 and beyond. 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. Again, unless I state otherwise, you will be expected to post assignments on CTools (in your DropBox folder) using an agreed upon file name and format.

EXTENSIONS: I will only accept late work in the event of special circumstances (e.g., family emergency, illness). If you need an extension, please talk with me in person or contact me via email or phone. **Make sure you contact me prior to any given due date.**

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). You have one week from the time you received feedback to revise and resubmit. In addition to the revised assignment, you must also provide
a summary of the revisions you made based on the feedback you received.

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. Purdue University also has a very helpful online APA guide: http://owl.english.purdue.edu/owl/resource/560/01/

COURSE ASSIGNMENTS
NOTE: More information (i.e., detailed assignment guidelines with rubrics, when applicable) will be posted to CTools in a timely fashion and discussed in class.

1. Participation – 5 points per class session; 60 points total – 10% of final course grade
Due Date: Rolling throughout the semester
As noted above, 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, post to a CTools discussion forum, design an activity that relates to the readings, find various web sites, etc. You are expected to come to class having already done the readings and ready to participate in discussions and other activities.

2. Lead Two Class Discussions – 60 points each – 20% of final course grade
Due Date: Rolling throughout the semester
In order to gain practice in facilitating dialogue and deconstructing course literatures, you will lead two class discussions over the readings during two weeks of your choosing.

3. Scientific Practice Observation and Informal Interview – 120 points – 20% of final course grade
Due Date: October 21
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). As part of your observations, you will also conduct informal interviews with people in those settings.

4. Artifact Analysis – 120 points – 20% of final course grade
Due Date: November 11
Again, to concretize course themes, you will analyze an artifact, in part 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 – 180 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, is
most applicable to you. 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 also choose to explore publication decisions for the past five years of a Science Studies-related journal, such as Social Studies of Science. 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. 21; 20 points)
-- Final Project Outline (due Nov. 18; 40 points)
-- Final Project (due no later than Dec. 13; 120 points)

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

**COURSE SCHEDULE***
*I reserve the right to revise this schedule whenever necessary, and based on our progress in the course. I am in the process of securing guest speakers for the course, which might impact the draft schedule listed here.

**WEEK 1 – SEPTEMBER 9, 2013 – COURSE INTRODUCTION**

**READINGS:**
→ Chapter 3: Scientific and Engineering Practices
→ NOTE: You can download this publication for free at: [http://www.nap.edu/catalog.php?record_id=13165](http://www.nap.edu/catalog.php?record_id=13165)

→ Chapter 1: The Prehistory of Science and Technology Studies

**OPTIONAL READING:**

**ASSIGNMENTS:**
1. Begin to think about where you might want to conduct your observations & interviews for the Scientific Practices assignment.
2. Come to class next week ready to sign up for two reading-discussion facilitations

**WEEK 2 – SEPTEMBER 16, 2013 – PART I: SCIENTIFIC PRACTICES**

**READINGS:**
→ Read Chapter 1: The Mangle of Practice


**Optional Reading:**


→ You can download this publication at this NAP website: [http://www.nap.edu/catalog.php?record_id=9596](http://www.nap.edu/catalog.php?record_id=9596)

**Assignments:**
1. Solidify your observation/interview site for your Scientific Practices assignment. This assignment is due on or before Oct. 21.
2. Schedule a time to meet with me about your final course project. This meeting must take place no later than Oct. 21.

**Week 3 – September 23, 2013 – Modeling**

**Readings:**
Read the Stanford Encyclopedia of Philosophy entry about modeling:
[http://plato.stanford.edu/entries/models-science](http://plato.stanford.edu/entries/models-science)


**Optional Reading:**

**Assignments:**
1. Continue working on your Scientific Practices assignment. The assignment is due on or before Oct. 21.
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. 21.
3. Begin to think about what artifact you might want to analyze against course themes.
WEEK 4 – SEPTEMBER 30, 2013 – EVIDENCE-BASED ARGUMENTS

READINGS:
→ Chapter 13: Rhetoric and Discourse

ASSIGNMENTS:
1. Continue working on your Scientific Practices assignment. The assignment is due on or before Oct. 21. NOTE: We will discuss your progress in class next week. You can use this as an opportunity to ask questions, seek advice, etc. before you finalize your work in preparation for the Oct. 21 deadline.
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. 21.
3. Come to class next week prepared to discuss what artifact you want to analyze against course themes for your analysis assignment (assignment due on or before Nov. 11).

WEEK 5 – OCTOBER 7, 2013 – EVIDENCE-BASED EXPLANATIONS

READINGS:

ASSIGNMENTS:
1. Remember that your Scientific Practice assignment is due on Oct. 21. Upload this document to your Dropbox on CTTools. 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. 21.
3. Remember that your Analysis assignment is due on Nov. 11. You will have an opportunity on Oct. 28 in class to discuss your progress, ask questions, seek advice, etc. before you finalize your work in preparation for the Nov. 11 deadline.

WEEK 6 – OCTOBER 14, 2013 – NO CLASS: FALL STUDY BREAK

ASSIGNMENTS:
1. Finalize your Scientific Practice assignment (due next week).
2. Continue to work on your Analysis assignment (due on Nov. 11).
3. If applicable, begin aspects of your final course project.
PART II: OTHER TOPICS OF INTEREST

WEEK 7 – OCTOBER 21, 2013 – “THE NATURE OF SCIENCE”

READINGS:
→ Read Chapter 7: The Natural Ontological Attitude & the Afterward
→ Chapter 3: Questioning Functionalism in the Sociology of Science

OPTIONAL READING:
→ Chapter 2: The Philosophy of Science: An Interdisciplinary Perspective

ASSIGNMENTS:
1. Remember that your Analysis assignment is due on Nov. 11. You will have an opportunity next week in class to discuss your progress, ask questions, seek advice, etc. before you finalize your work in preparation for the Nov. 11 deadline.
2. If you haven’t already, begin work on your final course project (due on or before Dec. 13). Your project outline is due on Nov. 18.

WEEK 8 – OCTOBER 28, 2013 – HISTORY AND GEOGRAPHY OF SCIENCE

READINGS:
→ Chapter 2: The Kuhnian Revolution

OPTIONAL READING:
→ Read Chapter 11: What We Have Learned and Where We Are Headed?
Assignments:
1. Remember that your Analysis assignment is due on Nov. 11.
2. Continue working on elements of your final project. Your project outline is due on Nov. 18. You will have opportunities in class to discuss your progress, ask questions, seek advice, etc., on both Nov. 25 and Dec. 2. Your final course project is due on or before Dec. 13.

Week 9 – November 4, 2013 – Feminist Epistemologies of Science
Readings:
→ Introduction: Eurocentric Scientific Illiteracy – A Challenge for the World Community (Harding)
→ Race and Gender: The Role of Analogy in Science (Nancy Leys Stepan)
→ Chapter 7: Feminist Epistemologies of Science

Optional Readings:

Assignments:
1. Remember that your Analysis assignment is due next week.
2. Continue working on elements of your final project. Your final project outline is due on Nov. 18. You will have opportunities in class to discuss your progress, ask questions, seek advice, etc., on both Nov. 25 and Dec. 2. Your final course project is due on or before Dec. 13.

Week 10 – November 11, 2013 – Science Controversies
Readings:
→ Chapter 11: Controversies
OPTIONAL READING:

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., on both Nov. 25 and Dec. 2. Your final course project is due on or before Dec. 13.

WEEK 11 – NOVEMBER 18, 2013 – SCIENCE COMMUNICATION AND SCIENTIFIC "LITERACY"

READINGS:


OPTIONAL READINGS:


ASSIGNMENTS:
1. Continue working on elements of your final project. You will have opportunities in class (next week and on Dec. 2) to discuss your progress, ask questions, seek advice, etc.

WEEK 12 – NOVEMBER 25, 2013 – ANTHROPOLOGY OF SCIENCE/STUDIES OF LABORATORIES

READINGS:


→ Chapter 10: Studying Laboratories

**Revisit the NRC’s *Framework*, Chapter 3 (Scientific Practices) that we read for Week 1.

**Assignments:**

1. Continue working on elements of your final project. You will have another opportunity in class next week to discuss your progress, ask questions, seek advice, etc. Final projects are due on or before Dec. 13.

**Week 13 – December 2, 2013 – Special Topics**

**Readings:**

TBD

**Assignments:**

1. Continue working on elements of your final project. Final projects are due on or before Dec. 13.

**Week 14 – December 9, 2013 – Special Topics**

**Readings:**

TBD

**Assignments:**

1. Final projects are due on or before Dec. 13.