APMA 1910: Race and Gender in the Scientific Community (Spring 2018)

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Canvas: https://canvas.brown.edu/courses/1074436
Lectures: TR 9:00-10:20am

Learning goals and objectives:

This course examines disparities in representation in the scientific community, issues facing different groups in the sciences, and paths towards a more inclusive scientific environment. We will delve into the current statistics on racial and gender demographics in the sciences and explore their background through texts dealing with the history, philosophy, and sociology of science. We will also explore the specific problems faced by under-represented and well-represented racial and ethnic minorities, women, and LGBTQ community members. The course is reading intensive and discussion based.

By the end of the course, you will

- be a critical reader of literature on race and gender in the scientific community;
- have a broad understanding of how culture affects science;
- identify challenges faced by different groups and understand some of the psychological and sociological mechanisms underpinning these challenges;
- have established an understanding of implicit bias, stereotype threat, and their effects;
- be able to design strategies for fostering more inclusive learning strategies and mentoring conversations.

Course format:

Course enrollment is limited, since class time will be largely discussion based. I expect a dynamic and interactive environment during which we will discuss and reflect on the reading assignments. We will complete written reflections on our readings before each class and brief essays about our discussions at the end of each week. I will also ask each participant to summarize a few initial reactions in a blue book after each class. Each student will lead a discussion once during the semester and write a brief essay about their experience. The final project will be done in small teams: projects may involve further research into topics covered in class, exploring additional topics not discussed in class, the development of handouts that summarize inclusive advising and teaching strategies and plans for distributing these, or engaging in advocacy activities: the expected outcomes of the final project include an initial proposal on which teams will receive feedback from the entire class, a written final report (possibly with additional materials developed as part of the project), and a final poster presentation.

Prerequisites:

Preference will be given to STEM concentrators and to students interested in concentrating in STEM fields. Students should have taken a WRIT course and ideally have experience with reading-intensive courses.

Topics:

- Facilitating and participating in discussions; share our goals for this course
- Defining race and gender
- Statistics regarding demographic representation in the scientific community
- Philosophy of science
- History of science development
- “Scientist” as an identity
- Implicit bias, imposter syndrome, stereotype threat, and how they affect individuals
- Challenges faced by under-represented and well-represented minorities
- Gender: women as scientists in the past and present
- LGBTQ scientists and science
- Intersectionality
- Science education and its impact on race and gender dynamics
- Inclusive advising, mentoring, teaching, and learning.

Time expectations:

Class time	39 hours
Reading for class (6hr/week)	78 hours
Written reflections (2hr/week)	26 hours
Discussion leader	2 hours
Final project	35 hours
Total for semester	**180 hours**

Assessment:

This course is mandatory S/NC. The assessment is broken down into the following components:

Class participation	20%
Pre-class reading reflections	20%
Post-discussion summary reflections	20%
Discussion-leader preparedness	10%
Small-group final project	30%

The grade for the final project is broken down into the final written report (20%) and a presentation (10%). More details about the different components can be found below.

Accommodations for students with disabilities:

If you need accommodations for classes, assignments, or exams, please contact me as soon as possible. Please also contact the Student and Employee Accessibility Services (by phone 401-863-9588 or online at http://brown.edu/Student_Services/Office_of_Student_Life/seas/index.html)

Diversity and inclusion statement:

I would like to create a learning environment for you that supports a diversity of thoughts, perspectives, and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, …). To help accomplish this:

- If you have a name and/or set of pronouns that differ from those that appear in your official Brown records, please let me know!
- If you feel that your performance in the class is being impacted by your experiences outside of class, please do not hesitate to come and talk with me. I want to be a resource for you. If you prefer to speak with someone outside of the course, Dean Bhattacharyya (Associate Dean of the College for Diversity Programs) is a great resource.
- I am still in the process of learning about inclusion and diverse perspectives & identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.
- As a participant in course discussions, you should also strive to honor the diversity of your fellow classmates.

Anonymous feedback: You can provide anonymous feedback for this class here:

https://goo.gl/forms/SmabusM4b3EbKvOD2

The fine print …

- Canvas: All announcements and assignments will be posted exclusively on Canvas: please make sure you receive notifications from Canvas so that you stay informed of announcements and deadlines.
- Completing the reading assignments before class is absolutely crucial for the success of this class. The reading list will be broken down into essential and supplemental materials so that we can focus on the key reading materials and expand on them through additional materials. I have also structured the written reflections so that they encourage pre-class readings and prepare us well for the in-class discussions. You will benefit far less from this class if you do not complete the required reading prior to class.

Course structure

Pre-class reading reflections:

Prior to each class, I will provide a brief list of questions that will guide you through the reading and allow you to structure your reading better. Some of the questions will focus on the content of the materials, others will ask you to think critically about the assumptions and methodologies used in the papers. I will also ask you to respond prior to class with an essay in which you (i) define some of the concepts and terms encountered in the reading (e.g., what is scientific objectivity, stereotype threat, …), (ii) reflect on the guiding questions I posed, and (iii) formulate additional questions that you would like to discuss and focus on during class.

In-class discussion:

We will use the class meetings to discuss the materials we read. I will ask one or two of you to help plan the guiding questions that we will use to structure the meeting and to facilitate the discussion.

Encourage critical reading:

In spring 2017, some students felt that the course did not achieve the goal of them becoming "critical reader[s] of literature on race and gender in the scientific community". To work more on these skills, I added questions to the reading and summary reflections that specifically ask you to assess the validity of methodologies and conclusions of the readings. In addition, I will allocate time to address these questions during the in-class discussions.

Post-discussion summary reflections:

At the end of each week, you will write a post-discussion essay in which you reflect on your reading and the in-class discussions. I will ask you to provide a concise response to the questions that guided us through the discussion and to reflect critically on the reading materials (including questioning the methodologies used and assessing the validity of the conclusions drawn in the research papers). I will also ask you to reflect on your own learning and class participation, for instance by asking you to address the following questions:

- Have I gained a better or different understanding of the topic through the reading and discussion?
- Have I broadened my thinking or generated new thoughts or ideas not previously formulated?
- Have I helped my peers clarify their thinking and in doing so clarified my own thinking?

Final group projects:

Goals: The goal of the final project is to engage closely with a topic related to the class material, for instance by exploring topics in more depth, pursuing outreach activities to campus communities on STEM-related issues, advocating for specific changes in STEM advising or courses at Brown based on our readings and discussions, or develop fact sheets for faculty or students.

Project essay: The aim of the project essay is to provide a record of your work on the topic you selected. The essay should be 5-10 pages (single spaced) and explain the goal of your project and the rationale behind it, present in detail your main findings and outcomes, and provide a thorough discussion of the work that led to your main findings or outcomes. The essay can be accompanied by additional materials (eg if you worked on fact sheets, videos, or specific recommendations) if they are part of your outcomes.

Project presentation: The aim of the final presentations is to communicate your main findings and outcomes to others in the class and across Brown. The final product for your presentation could be a poster that outlines your main conclusions and outcomes and summarizes the rationale behind them, or a video or art object with a description of the work you did.

Grading: I will use a rubric that reflects the aims of essay and presentation, namely, the validity of methodologies, clarity and accuracy of conclusions drawn, and effectiveness of your presentation top communicate your main findings.

Final projects from APMA 1910 (spring 2017):

- Guidelines for Promoting Inclusivity in Introductory STEM Classes for Professors
- Women in STEM at Brown University
- Uncovering the Implicit Bias for Men in Science and Women in Liberal Arts at Brown University
- Recommendations for Creating an Inclusive Mathematics Community at Brown University
- An Analysis of the First Year Experience in STEM at Brown

- Inclusive Teaching in Introductory College-level STEM Courses
- Intersectionality in the Brown Scientific Community
- Girls Rule Science: Children's Illustrations Celebrating Women Scientists
- Increasing Retention Rates of Undergraduates in STEM
- A video summarizing interviews with STEM students at Brown

Additional changes anticipated:

I will make several changes to the reading list that we used in spring 2017 by removing some papers that did not contribute much to our discussions, add more overview and survey material on objectivity in science to streamline and focus the discussion more, add a section on the definition/notion of race and gender, and add material on intersectionality.

Preliminary Reading List

Day 1: Facilitation & Safe Space

Description: To discuss how can we create a safe and productive space for sharing personal narratives, the readings will cover facilitation skills, with a special focus on conversations around race. We will also discuss what our own goals are for this class.

Guiding Questions: How can we create an environment that is respectful and comfortable for all despite our differences? How can we structure discussions so that we can challenge our views and perspectives in a constructive and nonthreatening way? What would you like to see in this space in order to feel encouraged to share your personal experiences?

- "Fundamentals of Facilitation for Racial Justice Work - Workshop Pre-reading." *Interaction Institute for Social Change*. N.p., n.d. Web. 23 Mar. 2014. (10 pages)
  [This is the pre-reading assignment for a workshop on designing and facilitating conversations on about racial justice work that fosters authentic engagement]
- Bell, Lee Anne, and Rosemarie Roberts. "The Storytelling Project: Learning about Race and Racism through Storytelling and the Arts." *Storytelling Project*. Barnard College, Feb. 2008. Web. 23 Mar. 2014. (15 pages)
  [This is a report on the Storytelling Project Model, which links research to practice through the development of a curriculum to teach about racism and social justice]
- Lakey, Berit. "Meeting Facilitation." *Reclaiming*. N.p., Apr. 1975. Web. 23 Mar. 2014. (6 pages)
  [This short handout discusses both the logistical and emotional aspects of facilitating a productive discussion]
- "A Community Builder's Tool Kit." A Project of The Institute for Democratic Renewal and Project Change Anti-Racism Initiative, n.d. Web. (40 pages)
  [This handbook discusses 15 tools for individuals and groups seeking to organize a community seeking to solve some of its most pressing issues. A particular emphasis is placed on issues relating to race]
- Gayle, Barbara Mae, Derek Cortez, and Raymond W. Preiss. "Safe Spaces, Difficult Dialogues, and Critical Thinking." *International Journal for the Scholarship of Teaching and Learning* 7.2 (2013): 1-8. Web. (10 pages)
  http://digitalcommons.georgiasouthern.edu/cgi/viewcontent.cgi?article=1390&context=ij-sotl
  [This article discusses strategies for encouraging participation and fostering holistic learning even in the presence of complex and highly emotional issues]

Day 2: Statistics/ Background

Description: This class is devoted to familiarizing ourselves with data surrounding issues of representation, so that we are all well-equipped with the most up-to-date facts prior to diving in to more theoretical concerns. We will be skimming an extensive report put out by the National Science Foundation, as well as reading an article about a class similar to this taught here at Brown that began much of the discussion around these issues here. We think that grounding ourselves with data early in the semester will allow us to put future readings in perspective and better evaluate claims for the rest of the semester. It will also help us learn how our experiences, examined in Day 1, fit in to the broader statistical picture.

Guiding Questions: Which of the data were particularly surprising? Which of the data are of particular concern to you? How are these data collected, represented, and visualized, and by whom?

- English, Lydia, and Anne Fausto-Sterling. "Women and Minorities in Science: An Interdisciplinary Course." *The Radical Teacher* 30 (1986): 16-20. Web.
  [This article describes a class similar to this class taught in the 80s at Brown by Professor Fausto-Sterling, including their objectives and results]

- National Science Foundation, National Center for Science and Engineering Statistics. 2013. Women, Minorities, and Persons with Disabilities in Science and Engineering: 2013. Special Report NSF 13-304. Arlington, VA.
  [This report is a good resource on statistics regarding the representation of various communities in the sciences]

Day 3: General Philosophy of Science

Description: In this class we will present an overview of the philosophy of science. We will discuss the concepts "normal science", "objectivity", and "scientific revolutions". This discussion will lay a basic groundwork for understanding the sociology of the scientific process.

Guiding Questions: Central questions we will focus on:
- Is science objective (faithful to facts, free of values, and without personal bias)?
- What are the arguments for the necessity of diverse scientific communities in Kuhn's and Longino's theses?

- Kuhn, Thomas S. The Structure of Scientific Revolutions. pp. 10-34, 92-110
  [This is a classic work in the history of science, which offers a theory for how scientific revolutions happen and explains the structure of the scientific community]
- Longino, Helen E. Science as Social Knowledge: Values and Objectivity in Scientific Inquiry. pp. 62-82
  [Longino discusses the manner in which context must inform scientific inquiry}

Day 4: Feminist Philosophy of Science & Diversity Arguments

Description: In this class we will discuss several theoretical arguments from feminist philosophers of science concerning the makeup of the scientific community and its ramifications for the authority of "objective" scientific inquiry. This day is meant to build upon the previous day's discussions of general theories in the philosophy of science by looking at how feminist scholars have responded to these problems with an eye to gender and other forms of difference. This will aid our analysis of the history and culture of science in the coming days by giving us the tools to look at these issues from a feminist analytical lens.

Guiding Questions:
- Recall arguments for and against scientific objectivity
- Recall arguments for and against standpoint theory
- According to Haraway and Harding, what is the role of a diverse community that includes underrepresented groups in obtaining knowledge?
- Do the arguments for standpoint theory apply to research in the natural sciences?

- Harding, Sandra. *The Science Question in Feminism.* 1986. pp. 15-49, 136-162. [60 pages]
  http://www.andrew.cmu.edu/course/76-327A/readings/Harding.pdf
  [This piece explores the implications of science for feminism, and the implications of feminist theory for scientific theory and practice]
- Haraway, Donna. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." [24 pages] http://www.staff.amu.edu.pl/~ewa/Haraway,%20Situated%20Knowledges.pdf
  [Haraway provides her vision for feminist science, critiquing masculinity]
- Harding, Sandra. "Rethinking Standpoint Epistemology: What is 'Strong Objectivity'" in Feminist Epistemologies, ed. Linda Alcoff and Elizabeth Potter. New York: Routledge, 1992. [33 pages] https://www.msu.edu/~pennock5/courses/484%20materials/harding-standpoint-strong- objectivity.pdf
  [This later piece by Harding prompts us to pay close attention to the idea of "objectivity" and the implications of the makeup of the scientific community for the productive of "good" and "objective" science]

Day 5: How Science Developed

Description: We investigate how science developed, focusing on accounts of the people who developed it, paying special attention to who they are and how they are described in relation to the social circumstances of their time. This week will highlight how science has certain cultural perspectives "built-in," and how it is approached differently by people from different cultures.

Guiding Questions: Central questions we will focus on:
- What are the key ingredients of "practicing science"?
- Argue whether, and to what degree, Micronesian navigators and James Bay Cree hunters are scientists
- How do the viewpoints of Cree on the interplay between humans and nature differ from our Western view?
- How do these views of the world impact how we do science?

- Harding, Sandra, ed. The postcolonial science and technology studies reader. Duke University Press, 2011. Selected essays from Parts II, Other Culture's Sciences, and Part IV, Moving Forward: Possible Pathways. (Page numbers: 159-198.)
  [This is a collection of essays about the importance of culture upon science. Specifically, it focuses on how non-Western European cultures interact with science and how their own sciences differ]

Day 6: The Scientist Identity Today

Description: This class will focus its discussion on the Scientist Identity *today* and specifically how that identity affects identities of race and gender and vice versa. We will explore the sometimes alienating nature of science (and higher education) and how it can form divides within and between communities. We will be reading case studies and talking to academics (professors and postdocs) that include scientist as a part of their identity.

Guiding Questions: Is "scientist" an identity? How does claiming or rejecting this identity interfere or strengthen other identities? What are the stereotypes of being a scientist and how do they interact with other stereotypes? Do scientists have a culture? Is this culture western/white/male/cis or reflective of who is in the community?
- Do we think of ourselves as scientists? Why, or why not?
- How do we define identity? (internal image vs external perception; profession vs identity; aspiration vs growing into an identity)
- Science vs Scientist identity ("what I want to become and do in science" vs "becoming a scientist")
- Scientist as an identity: Do we agree with the scientist identity model put forward by Carlone & Johnson (competence, performance, recognition)? Are there alternative scientist identities beyond researcher, altruist, disrupted scientist? Do we conform to existing identities or is scientist identity changing?
- Obstacles to pursuing a science identity: innate vs acquired ability; school vs real science; science as a finished body of knowledge; scientist stereotypes; masculine norms (weed-out courses, must be special to pursue science, …)

- Lee, Okhee. "Culture and language in science education: What do we know and what do we need to know?." *Journal of Research in Science Teaching* 38.5 (2001): 499-501.
  [This article explores how language can contribute to an equitable learning environment]
- Brown, Bryan A. "Discursive identity: Assimilation into the culture of science and its implications for minority students." *Journal of Research in Science Teaching* 41.8 (2004): 810- 834.
  [This study looked at interpersonal relationships between ethnic minority students in science classrooms]
- Frink, Brenda D. "Research reveals how 'Computer Geeks' replaced 'Computer Girls' " *The Clayman Institute for Gender Research.* (2011).
  [This press release discusses how the typical identity of a computer scientist switched from female to male]
  Nosek, Brian A. "National differences in gender-science stereotypes predict national sex differences in science and math achievement." *Proceedings of the National Academy of Sciences of the United States of America* 106.26 (2009):

10593-10597.
[This study provides evidence for gendered stereotypes about science ability]
Archer, Louise. " 'Doing' science versus 'being' a scientist: Examining 10/11-year-old schoolchildren's constructions of science through the lens of identity." *Science Education* 94.4 (2010): 617-639.
[Archer explores how children's interest in science develops over time]

- Carlone, Heidi B. "Understanding the Science Experiences of Successful Women of Color: Science Identity as an Analytic Lens." *Journal of Research in Science Teaching* 44.8 (2007) 1187-1218.
[This article looks at the manner in which scientific identity is formed for underrepresented groups]

Day 7: Stereotype threat

Description: A class devoted entirely to issues involving stereotype threat and imposter syndrome: two issues governing the psychology of being underrepresented; they lead to underperformance by students in the sciences as well as in other areas in life. We will use Claude Steele's *Whistling Vivaldi*, perhaps the most influential book on the subject of stereotype threat, to introduce us to the concept, its effects, and varying methods of reducing this threat in classrooms.

Guiding Questions: What is stereotype threat? Who is impacted by stereotype threat, and how? How does this threat shape our identities? What can be done to reduce stereotype threat?

- Steele, Claude. *Whistling Vivaldi: How Stereotypes Affect Us and What We Can Do*. New York, NY: W.W. Norton & Company, Inc., 2010. Print.
[This book is considered the leading work on stereotype threat, the experience of anxiety in a situation in which a person has the potential to confirm a negative stereotype about his or her social group. The selections listed here introduce the concept of stereotype threat, give evidence for its existence, discusses how it ties in to academic performance, and provides potential solutions to students' anxiety]
Selections:
  - Chapter 1: At the Root of Identity, p1-15 (15 pgs)
  - Chapter 2: Identity and Intellectual Performance, p16-43 (27 pgs)
  - Chapter 9: Reducing Identity and Stereotype Threat: a New Hope, p152- 190 (38 pgs)
  - Chapter 10: The Distance Between Us: The Role of Identity Threat, p.191-210 (19 pgs)

Day 8: Underrepresented minorities

Description*:* We are going to look at three major groups of underrepresented minorities (URM): Black students, Latin@ students, and Native American students, to examine some of the unique challenges students identifying with any of these groups face. Examining each group in depth will lend us a better idea of the systemic problems that lead to the dearth of URMs in the sciences..

Guiding questions: What are some similarities/differences in the struggles/obstacles that students from these different URM groups face today? What historical/contemporary social and institutional factors play a role in these struggles/obstacles? How were the perspectives of scholars who self-identified with the racial/ethnic groups they wrote about different from those who did not? What assumptions were made about Black, Latin@, and Native American students in each of these readings? Are there students within each defined racial/ethnic group explored with these readings that were erased/may have different experiences from the ones the authors considered in their texts? Are there specific arguments from any of today's readings that you found especially compelling, or arguments you found problematic? What are some things today's readings' analyses in general?

- Garrison, Howard (2013). Underrepresentation by Race–Ethnicity across Stages of U.S. Science and Engineering Education. CBE—Life Sciences Education, Vol. 12, pp. 357–363. 7 pages

[This articles discusses the degrees of underrepresentation at different levels of education of minority groups to better understand and provide solutions for the underrepresentation of certain minority groups in STEM fields]

Black students:

- Mutegi, Jomo W. (2011). The Inadequacies of ''Science for All'' and the Necessity and Nature of a Socially Transformative Curriculum Approach for African American Science Education. Journal of Research in Science Teaching, Vol. 248, No. 3, pp. 301-316. 13 pages
  This article discusses how the "science for all" ideology that has shaped education reform for decades fails Black students in the United States, and argues for reforms that are historically and socially informed]
- Russell, Melody L. and Mary M. Atwater (2005). A Discourse on Persistence throughout the Science Pipeline with African American Students at a Predominantly White Institution. Journal of Research in Science Teaching, Vol. 42, No. 6, pp. 691-715. 20 pages
  This study focuses on 11 Black undergraduate seniors in a biology degree program at a predominantly white research institution in the southeastern United States, and recounts their experiences and what factors they think contributed to their place in college.]

Latin@ students:

- Villarreal, Rebecca (2012). Charting a Course towards Latino Student Success in Science, Technology, Engineering and Mathematics. University of Maryland. 17 pages
  [This paper discusses key factors necessary to the success of Latin@ students in the STEM fields]
- Flores, Glenda M. (2011). Latino/as in the hard sciences: Increasing Latina/o participation in science, technology, engineering and math (STEM) related fields. Latino Studies Vol. 9, pp. 327– 335. 9 pages
  [This paper addresses the fact that Latin@s are currently underrepresented in STEM fields, and gives possible solutions to these issues]
- Núñez, Anne-Marie. Employing Multilevel Intersectionality in Educational Research: Latino Identities, Contexts, and College. Educational Researcher Vol. 43, No. 2, pp. 85-92. 8 pages
  [This article discusses the necessity of the concept of intersectionality for thinking about why certain social groups – particularly Latin@s in this case, but not confined to them only – are underserved by our educational system]

Native Students:

- Bowman, Nicole (2003). Cultural Differences of Teaching and Learning: A Native American Perspective of Participating in Educational Systems and Organizations. American Indian Quarterly, Vol. 27, No. 1/2, Special Issue: Native Experiences in the Ivory Tower, pp. 91-102. 13 pages
  [This is a paper written by a Native American woman about the absence of Native Americans from postsecondary education, and the ways in which the Western school system has failed Native students]
- Pavel, D. Michael (1999). American Indians and Alaska Natives in Higher Education: Promoting Access and Achievement. K. G. Swisher and J. W. Tippeconnic, III (Eds.), Next steps: Research and practice to advance Indian education, pp. 271-296. SKIM: 22 pages
  [This is a chapter about the different factors that affect the success of Native students in higher education, particularly pre-higher education disparities between Native students and well-represented populations]
- Kimmer, Robin W (2002). Weaving Traditional Ecological Knowledge into Biological Education: A Call to Action. BioScience, Vol. 52, No. 5, pp. 432-438. 6 pages
  [This is an article discussing the integration of traditional ecological knowledge, an often ignored body of knowledge, into biological education to be more inclusive to indigenous, non-Native ways of thinking]

Day 9: Underrepresented minorities

Class description: Today's class will consider how issues concerning URM (underrepresented minorities) are framed, and how the way we frame conversations surrounding these issues could affect possible policies and other solutions devised. We will also consider what narratives are lost from the ways research on URM is conducted, and the consequences that come with grouping/not grouping URM together.

Guided questions: What are common ways in which we currently think about the differences in academic, as well as the "achievement gaps" that exist between URM and WRM/white students? What are some problems associated with how we commonly think about these issues? Are there better ways to consider these issues? How are the possible solutions to amending these "achievement gaps" affected by the ways we frame conversations around these gaps? What do we gain from thinking about URM as a cohesive group? Likewise, what do we lose from grouping all URM together (consider last class' readings)? Furthermore, what are some problems associated with the fact that women of color are typically grouped together with URM in general? Are there specific arguments from any of today's readings that you found especially compelling, or arguments you found problematic? What are some things today's readings' analyses in general?

- Byars-Winston, Angela et al. (2010). Influence of Social Cognitive and Ethnic Variables on Academic Goals of Underrepresented Students in Science and Engineering: A Multiple-Groups Analysis. Journal of Counseling Psychology, Vol. 57, No. 2, pp. 205–218. (27 pages online)
  [This study that looks at goals of URM students, comparing biology and engineering]
- Gutierrez, Rochelle (2008). A "Gap-Gazing" Fetish in Mathematics Education? Problematizing Research on the Achievement Gap. Journal for Research in Mathematics Education, Vol. 39, No. 4, pp. 357-364. 9 pages
  [This article looks critically at the research on achievement gaps between races and ethnicities]
- Towns, Marcy (2010). Where Are the Women of Color? Data on African American, Hispanic, and Native American Faculty in STEM. Journal of College Science Teaching, Vol. 39, No. 4, pp. 6-7. 2 pages
  [Towns calls for action on recruiting women of color to the sciences]
- Ong, Maria (2005). Body Projects of Young Women of Color in Physics: Intersections of Gender, Race, and Science. Social Problems, Vol. 52, No. 4, pp. 593-617. 24 pages
  [Ong studies ten women of color in physics, offering suggestions on how to improve their experiences in universities]

Day 10: Gender: Historical Perspective

Description: The class will focus mainly on the extent to which women have contributed to the scientific community and how they made these contributions in the early 20th century starting with Marie Curie. We will read texts that explore these topics and ideas from leading experts in the field (such as Margaret Rossiter and Londa Schiebinger), and these will help inform our understanding the origins of some of the things that women in modern science experience.

Guiding Questions: What were the roles that women played in science in the early 20th century? Who were the major women scientists in this time period? What were the difficulties they faced in terms of either being able to do work or be recognized for the work they do? How were strategies they used to overcome these obstacles? What are some similarities to today?

- Des Jardins, Julie. *The Madame Curie Complex: The Hidden History of Women in Science.* New York, NY: The Feminist Press at the City University of New York, 2010. Print Section 1: p.12-20 (8pgs)
  [The selected sections in this book give brief overviews of the history of women's status in science and perceptions of women as scientists in three historical eras: 1880-1940, 1941-1962, and 1962 onward.]
  - Section 2: p.117-128 (11 pgs)
  - Section 3: p.201-216 (15 pgs)
  - Conclusion: p.285-292 (7 pgs)
- Women Scientists in America: Struggles and Strategies to 1940 by Margaret W. Rossiter; Review by: Suzanne Hildenbrand. http://www.jstor.org/stable/25541460 (3 pages)
  [This is a review article of Margaret Rossiter's groundbreaking book on the role of women in science prior to when they were formally allowed to participate as equals]
- *The Mind Has No Sex?: Women in the Origins of Modern Science* by Londa Schiebinger (10-32, 98-101, 121-127, 265-278)
  [Schiebinger discusses how gender shapes knowledge and the role of women in the Enlightenment period]

Day 11: Gender: Women as Scientists Today

Description: This class will focus on the role of women in the sciences from 1970 to the present. We will work with historical as well as statistical texts to gain an appreciation for the place that women occupy in the sciences as well as struggles that they face in the scientific community. We intend to back up narratives and historical studies with empirical evidence spanning areas as diverse as Ph.D. program dropout rates, hiring bias, funding disparities, and publishing bias.

Guiding Questions: What are the three greatest barriers to women in the sciences? How can we go about helping women to surmount these barriers effectively?

- *Women Scientists in America: Forging a New World since 1972* by Margaret W. Rossiter (21-41, 95-118)
  [This book discusses the struggles and successes of female scientists in the era of affirmative action. The selected chapters address confrontation with the academic establishment, obstacles to female scientists in graduate school, experience of female scientists after earning their doctoral degrees, and the similarities and differences of issues facing female scientists in the private sector, the public sector, and the non-profit sector.]
- "Beyond Bias and Barriers"- National Academy of Sciences Report (12 pages) http://www.med.upenn.edu/focus/user_documents/bias_summary.pdf
  [This summary reports the findings of an extensive study on root causes behind the lack of women in the sciences]
- "How Stereotypes Impair Women's Careers in Science" by Ernesto Reuben, Paola Sapienza, and Luigi Zingales (20 pages)
  http://www.ereuben.net/research/StereotypesWomensCareer.pdf
  [This report looks directly at the effects of stereotypes on women's careers at various stages]
- "How to Help End Gender Bias While Hiring" by Will Yakowicz (1 page) http://www.inc.com/will-yakowicz/how-to-help-end-gender-bias-while-hiring.html
  [Yakowicz's brief article recounts recent research into gender bias in the hiring process]

Day 12: LGBTQ Scientists & Science

Description: After discussing gender and the experience of women in science, we felt it would tie in nicely to have a day devoted to LGBTQ science and scientists. Some of the same assumptions and power dynamics that affect the experiences of women in science are relevant here, so it is appropriate that this day come after our discussions of gender in science. This day also marks a transition to discussion of groups for whom the academic literature regarding the groups participation in science is less robust than for groups previously discussed. This day will focus on the experience of LGBTQ people in the scientific community. The primary focus will be on the experience of queer scientists themselves, but there will also be attention paid to the ways that scientific research has and does conceive of differences in gender identity and sexuality, and the implications that this has for LGBTQ scientists. We will read theory, as well as magazine articles, personal accounts, and ethnography, in order to give insight into the interactions between the institution of science and LGBTQ people.

Guiding Questions: How do assumptions about sexuality and gender identity play out in scientific research? What implications does this research have for LGBTQ scientists and lay people? What is the experience of being an out LGBTQ scientist like today? What can be done to improve the situation for LGBTQ people in the sciences?

- Spanier, Bonnie. 2008. "Biological Determinism and Homosexuality" in *Same-Sex Cultures and Sexualities: An Anthropological Reader*, ed. J. Robertson. Oxford, UK: Blackwell Publishing Ltd. (33 pages)
  [This reading examines the centrality of sex, gender, and sexuality to the theory of human behavior and practice]
- Underhill, Vivian. **"**Queer Science: LGBT Scientists Discuss Coming Out at Work." *Bitch Magazine.* 2013. (short online article) http://bitchmagazine.org/post/queer-science-lgbt- scientists-discuss-coming-out-at-work
  [This article discusses the experiences of LGBT scientists in dealing with the inherent heteronormativity of the scientific community]

- Cech, Erin A. and Waidzunas, Tom J.(2011) 'Navigating the heteronormativity of engineering: the experiences of lesbian, gay, and bisexual students', Engineering Studies, 3: 1, 1- 24. (24 pages)
  [This article explores the ways that LGBT students at a major research university experience and navigate the culture of their engineering community]
- Stanford University Medical Center. "Transgender Experience Led Stanford Scientist To Critique Gender Difference." ScienceDaily. ScienceDaily, 14 July 2006. (short online article)
  [This article discusses the personal experiences of Professor Ben Barres, a trans* person who speaks about his experience as both a woman and a man in the scientific community]

Day 13: Well-Represented Minorities

Description: In this week, we will examine the experience of groups that are minorities in America, but are relatively well represented in the scientific community, focusing specifically on Asian and Asian American scientists. We will also look critically at the scholarship that has developed around representation in the sciences, of the type we have been reading in weeks prior.

Guiding Questions: How did the myth of the model minority developed? How has it affected Asian and Asian American scientists? Who is "lost" in the Asian and Asian American label?

- Teranishi, R.T. (2010) Asians In the Ivory Tower: Dilemmas of Racial Inequality in American Higher Education, pp. 1-16.
  [Teranishi's book relates the experience of Asians in modern American academia, and notes their importance to the system's function]
- Petersen, W. (1966). Success Story: Japanese American Style, New York Times Magazine, January 9, 1966.
  [This is the original article which first coined the term "model minority"]
- Lee, R.G. (2007). The Cold War construction of the model minority myth. In Contemporary Asian America: A Multidisciplinary Reader, Second Edition, Zhou, M. and Gatewood, J.V. (eds.). New York, NY: New York University Press, pp. 469-484.
  [Lee examines the historical roots of the model minority myth, and its pervasive effects]
- Museus, S.D. and Kiang, P.N. (2009). Deconstructing the model minority myth and how it contributes to the invisible minority reality in higher education research. New Directions for Institutional Research, no. 142, summer, pp 5-15.
  [Museus looks critically at the effects of the model minority myth in higher education research]
- Samura, M. (2011). Racial transformations in higher education: Emergent meanings of Asian American racial identities. In Asian American Education—Identities, racial issues and languages, Rong, H.L. (ed.). Charlotte, NC: IAP Information Age Publishing, pp.73-99.
  [Samura investigates the race and space as it relates to Asian American identities in higher education.]

Day 14: Well Represented Minorities (Continued)

Description: We will continue our study of well represented minorities by looking at minority scientists more broadly, and also focusing on recent quantitative studies that provide evidence for significant bias against Asian and Asian American scientists.

Guiding Questions: What are the conditions like today for well represented minorities in the sciences? What do these studies look at, and what do they ignore? What policy recommendations could positively affect the lives of Asian and Asian American scientists?

- Stanley, C.A. (2006). Coloring the academic landscape: Faculty of color breaking the silence in predominantly white colleges and universities. American Educational Research Journal 43(4), pp. 701-736.
  [This article uses first hand experiences of faculty of color, examining their experiences of teaching, mentoring, collegiality, identity, service, and racism]

- Teranishi, R.T. (2010) . AAPI degree attainment and field representation. In Asians In the Ivory Tower: Dilemmas of Racial Inequality in American Higher Education, pp. 122-144.
  [This second Teranishi article looks quantitatively at Asian Americans and Pacific Islanders' experience in higher education]
- Wyche, K.F. and Graves, S.B. (1992). Minority women in academia: Access and barriers to professional participation. Psychology of Women Quarterly, Special issue: Women and power, 16(4), pp. 429-437.
  [This detailed article examines the climate for women in academic psychology at multiple professional levels]
- Yan, W. (2011). What accounts for tenure of Asian American faculty: Findings from NSOPF:04. In Asian American Education—Identities, racial issues and languages, Rong, H.L. (ed.). Charlotte, NC: IAP Information Age Publishing, pp, 159-179.
  [Yan specifically looks at tenure as a measure for success and acceptance of Asian American faculty in American higher education]

Day 15: Science education (theory)

Description: We will use this class to critically examine the way in which educational practices affect racial and gender dynamics in the classroom. We accomplish this by reading theories of anti-oppressive education and then two pieces that apply that theory to math education, one at the middle school level focusing on race and one at the undergraduate level focusing on women. We will look at the classroom as a comprehensive whole looking at interactions between teachers and students (two-way interactions) and between classrooms and educational systems.

Guiding Questions: How does the teaching of science and math affect the practice of science and math? What aspects of a classroom environment promote diversity and encourage women and people of color pursue further study? In what ways can classrooms themselves be oppressive?

- Paulo Freire. Pedagogy of the Oppressed. (44 pages)
  [This foundational text proposes a new pedagogical paradigm in which the learner is treated not as an "empty vessel" but as a co-creator of knowledge. The paradigm is presented and discussed within a framework that regards traditional pedagogy as fundamentally oppressive]
- Kumashiro, Kevin. (2000). Towards a Theory of Anti-Oppressive Education. *Review of Educational Research* **70**: 25-53. (28 pages)
  [This article examines the four major approaches that educational researchers have taken in addressing oppression in a pedagogical context]
- Jessica M. Deshler and Elizabeth A. Burroughs. (2013). Teaching Mathematics with Women in Mind. *Notices of American Mathematical Society*. **60**(9): 1156-1163 (7 pages)
  [This article addresses concrete approaches to improving gender issues in mathematics education at the undergraduate level]
- Robert Moses and Charles Cobb. Radical Equations: Civil Rights from Mississippi to the Algebra Project. (Ch 1: Algebra and Civil Rights?, Ch 2: Learning from Ella: Lessons from Mississippi, Ch 5: Pedagogy: The Experience of Teachers and Students) (90 pages)
  [This book discusses the Algebra Project, a model for constructing a community-based solution to the inequality-perpetuating problems with math and science education in American schools]

Day 16: Science Education (Practice)

Description: Building off of the previous day's discussion, we will examine more practical issues in education on this day, skimming large reports as well as reading involved case studies on issues of science education, inequality, and calls for reform.

Guiding Questions: How is science taught? How does who is teaching science influence science education? How does who is being taught influence science education? Consider ways in which these influences are both just and unjust.

- Kozol, Jonathan (1991) Savage Inequalities, Chapter 3 (50 pages) "The Savage Inequalities of Public Education in New York"
  http://www.educ.ttu.edu/uploadedFiles/personnel-folder/lee-duemer/epsy-5310/documents/Savage%20inequalities%20of%20public%20education%20in%20New%20York .pdf
  In this chapter, Kozol provides a case study of public education in New York, contrasting the classroom experiences in more and less affluent communities]
- Dreifus, Claudia (2013). Ideas for Improving Science Education in the US http://www.nytimes.com/2013/09/03/science/ideas-for-improving-science-education-in-the- us.html (4 pages)
  [A reporter asked a number of prominent educators the question "How would you reform science education?"]
- "Research Spotlight on Single-Gender Education," by the National Education Association. http://www.nea.org/tools/17061.htm (2 pages)
  [This article provides a broad overview about recent scholarship on the potential benefits of single-gender education]
- Churney, I. A. (2011). "A League of their Own: Do Single Sex Schools Increase Girls' Participation in the Physical Sciences?" http://link.springer.com/article/10.1007/s11199-011- 0013-6 (10 pages)
  [Churney examines claims that single sex schools lead to broader STEM participation among women]

Day 17: Science Communication

Description: The focus of this class will be on science communication and discussion of the responsibilities scientists may have to communicate their own research. Prof. Cornelia Dean will lead this discussion as we explore the importance and effective methods of science communication. This discussion precedes the initiation of our final group projects, and the topics of discussion may prove useful to the facilitation of the projects.

Guiding Questions: What does it mean to be an effective science communicator? Is communication a responsibility for scientists? What can come from effective science communication? Is science communication the answer to improving science literacy in society? Will increasing science literacy help encourage diversity in the sciences?

- Science Communication versus Science Education: The Graduate Student Scientist as a K-12 Classroom Resource - Strauss et al. (2005) http://web.calstatela.edu/faculty/jstraus/Science%20Communication%20vs%20Science%20Education.pdf (5 pages)
  [This article discusses the gap between "those who know science" and "those who teach science," and examines a specific model for bridging this gap]
- Communication: A Responsibility of All Scientists http://www.scidev.net/global/communication/editorials/communication-a-responsibility-of-all- scientists.html (2 pages)
  [This editorial presents and argues for the position that communication within and beyond the scientific community should be a central part of a research scientist's professional role]
- What's Next for Science Communication? Promising Directions and Lingering Directions - Nisbet and Scheufele (2009) http://climateshiftproject.org/wp-content/uploads/2012/01/NisbetScheufele2009_WhatsNext forScienceCommunication_Promising DirectionsLingeringDistractions_AmericanJournalBotany.pdf (12 pages)
  [This article reviews research on how the public participates in societal decisions about science and technology, and discusses strategies for shaping and engaging in these conversations]
- Communicating Chemistry for Public Engagement - http://climateshiftproject.org/wp- content/uploads/2011/08/HartingsFahy_NatureChemistry.pdf
  [This essay discusses approaches to facilitating conversations between the chemistry community and the general public]

- The Construction and Analysis of the Science Story: A Proposed Methodology
  http://www.ucalgary.ca/ihpst07/proceedings/IHPST07%20papers/310%20Klassen.pdf (17 pages)
  [This article establishes a method of literary criticism for science stories]
- The Matilda Effect in Science Communication: An Experiment on Gender Bias in Publication Quality Perceptions and Collaboration Interest - Knobloch-Westerwick et al. (2013)
  http://scx.sagepub.com/content/35/5/603.full.pdf+html (23 pages)
  This article presents and discusses a research project that found a gender bias in the analysis of conference abstracts by communication scholars]

Day 18: Policy in the Past

Description: This day will focus on recent efforts by governmental and institutional entities to design and implement policies to effect change in the areas we are studying. The readings below examine the design, implementation, and effects of said policies. Here, we allow governmental initiatives to include local, state, and national level efforts, and institutional initiatives to include public and private universities, funding organizations, and industry.

Guiding questions: What approaches have been taken in the past to combat these issues? Who have been the primary actors? What have been the strongest driving forces? What strategies (or types of strategies) have been most successful? How can these strategies be improved and retooled for the future?

- Burke, Ronald J., and Mary C. Mattis. *Women and Minorities in Science, Technology, Engineering, and Mathematics: Upping the Numbers*. Cheltenham, UK: Edward Elgar, 2007. *Print. (245-276)*
  [This book discusses why increasing the number of women and minorities in STEM is crucial to a nation's economic performance and standard of living. It also presents concrete examples of actions that have been successful at improving representation]
- Sretenova, Nikolina. *What Has Worked in Europe to Increase Women's Participation in Science and Technology.* Rep. United Nations Division for the Advancement of Women, n.d. Web. http://www.un.org/womenwatch/daw/egm/gst_2010/Stretenova-EP.11-EGM-ST.pdf. (19 pages)
  [This article discusses the policies of the European Commission from 1999-2009 that sought to increase the participation of women in STEM fields]
- Tsui, Lisa. "Effective Strategies to Increase Diversity in STEM Fields: A Review of the Research Literature." *Journal of Negro Education* 76.4 (2007): 555-81. *JSTOR*. Web. http://www.jstor.org/stable/pdfplus/40037228.pdf?acceptTC=true&acceptTC=true&jpdConfirm= true
  [This review article discusses 10 intervention strategies that have been shown to be effective in increasing diversity in STEM fields]
- Balafoutas, L., and M. Sutter. "Affirmative Action Policies Promote Women and Do Not Harm Efficiency in the Laboratory." *Science* 335.6068 (2012): 579-82.
  [This article discusses the results of controlled experiments that found that certain policies could improve issues of gender representation without reducing overall efficiency]

Day 19: Policy in the Present and Future

Description: This day will build on the previous day's discussion to examine policies that are currently in place, as well as new policies and structures that have been designed or proposed so recently that their effects on inequality and representation remain unknown.

Guiding questions: What strategies are being employed today? How are these strategies similar to and different from strategies used in the past? How can different strategies, each with their own pros and cons, be synthesized to form cohesive action plans?

- Khadaroo, Stacy T. "Title IX at 40: What It's Done for Gender Equity – and the Road Still Ahead." The Christian Science Monitor. N.p., 30 June 2012. Web. http://www.csmonitor.com/USA/Education/2012/0620/Title-IX-at-40-what-it-s-done-for-gender-equity-and-the-road-still-ahead
  [This article discusses efforts being made to expand the existing law Title IX (traditionally associated with athletics) to issues of women in STEM]
- "Minorities in Energy Initiative." *Energy.gov*. Office of Economic Impact & Diversity US Department of Energy, 2014. Web. http://www.energy.gov/diversity/services/minorities-energy-initiative.
  [These documents discuss an initiative by the United States Department of Energy to create a sustainable model for connecting stakeholders and addressing the challenges facing minorities in STEM fields and energy economic participation]
- "ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers (ADVANCE)." *Nsf.gov*. National Science Foundation, n.d. Web. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383.;http://www.nsf.gov/pubs/2009/nsf09 41/nsf0941.pdf>
  [This report describes the ADVANCE initiative, a wide-ranging program of the National Science Foundation that seeks to increase the representation and advancement of women in the academic STEM community]
- "The Next Frontier of STEM Education: Ensuring Access For Minority Students."*GOOD*. N.p., n.d. Web. 18 Mar. 2014. http://www.good.is/posts/the-next-frontier-of-stem-education-ensuring-access-for-minority-students.
  [This article discusses several grassroots initiatives for improving gender and racial barriers to participation in stem fields]