Lesson Plan
Subtle Discrimination

Grade Level(s): 9-12	Subject(s): Physics, History, Contemporary

In-Class Time: 50-70 minutes	Prep Time: 15-30 minutes

Materials

- A/V equipment
- Internet access
- Photocopies of readings (located in Supplemental Materials)
- Photocopies of Discussion Questions (also in Supplemental Materials)

Objective

Students will learn about subtle discrimination, its negative effects on the careers of women in physics and astronomy, and strategies to eliminate it from the workplace and classroom.

Concepts & Vocabulary

- Social Studies: subtle discrimination, underrepresentation of women and minorities in STEM

Introduction

A glance around most college science classrooms and conferences reveals a great disparity in women's participation in science—especially in physics. Educators and scientists are working to understand and combat underrepresentation of women and minorities in STEM (science, technology, engineering, and mathematics) fields. Dr. Michal Lipson—a physicist who specializes in optics research— suggests that one deterrent to women is *subtle discrimination*, often experienced in school and in the workplace. This lesson introduces the concept of subtle discrimination, as well as measures taken by the scientific community to effectively address it.

Instructions

Engage: 10 Minutes

Students will observe video of Dr. Michal Lipson's lecture detailing her thoughts and experiences with *subtle discrimination* (link found below in Required Readings and Resources). Students will take notes on the video.	
What is the teacher doing? Present video of Dr. Michal Lipson to the class. The video is 42 minutes long, so stop playing the video at the 9:34 mark.	**What are the students doing?** Observe the video of Dr. Michal Lipson's talk on subtle discrimination. Note how she describes this concept, and her experiences with it.

Explore: 20-30 Minutes

Students will read and analyze documents that discuss subtle discrimination against women in scientific workspaces. Either individually or in groups, students will answer the provided Discussion Questions (found in Supplemental Materials) based on the readings.	
What is the teacher doing? Provide students with copies of the Urry article and the Baltimore Charter (both can be found in the Supplemental Materials). Instruct students to read the articles individually (or if desired, split students into small groups). Distribute the Discussion Questions (found in the Supplemental Materials) and have students answer them as they analyze and discuss the readings. If desired, teachers may collect answers for evaluation.	**What are the students doing?** Receive and read copies of Urry article and the Baltimore Charter. If instructed, split into small groups. Receive the Discussion Questions. Answer the questions while analyzing the readings and discussing them with your peers. If instructed, submit the answers to the teacher for evaluation.

Explain: 10-15 Minutes

The teacher will lead the class in discussing the documents and the answers to the Discussion Questions.	
What is the teacher doing? Lead a discussion with the entire class, based on the readings and the video, in which the students reflect on and examine subtle discrimination against women in physics. Provide answers to the Discussion Questions, to help ensure students internalize what they have read.	**What are the students doing?** As a class, examine each assigned document thoroughly. Raise any questions that remain after reading and completing the Discussion Questions. Then, discuss how subtle discrimination affects women in the physical sciences and beyond. Compare answers to the Discussion Questions to the correct ones provided by the teacher.

Elaborate: 10-15 Minutes

This section will help to contextualize the discussion of subtle discrimination by allowing the students to examine statistical data and testimonials of women in physics. The teacher will provide students with access to a report from the AIP Statistical Research Center that highlights women in the physical sciences (link and further information on the Report found in the Required Resources). Students will analyze this report, and afterward answer a second set of Discussion Questions provided by the teacher.	
What is the teacher doing? Provide students access to the AIP Statistical Research Center's Report on women in physics. Instruct each student to read from the bottom of	**What are the students doing?** Access and thoroughly read the AIP Statistical Research Report designated by the teacher. This information should help students visualize the

page 9 through page 12 (section titled "Opinions About Physics). Distribute copies of the second set of Discussion Questions (found in the Supplemental Materials) that pertain to the AIP report. Instruct students to complete the Questions, and if desired collect the answers for evaluation. Briefly ask students to reflect on subtle discrimination again, and whether the statistics help emphasize its reality.	reality of subtle discrimination against women in physics workplaces. Receive the second set of Discussion Questions, and answer them based on the AIP report. If instructed, submit the answers to the teacher for evaluation. Reflect again on subtle discrimination, and whether the statistics bear it out.

Evaluate:

Opportunities for evaluation emerged during the explore and elaborate sections of this lesson. Teachers may collect student responses to both sets of Discussion Questions for teacher evaluation.

Required/Recommended Reading and Resources

Readings

- Meg Urry, "Diminished by Discrimination We Scarcely See," *The Washington Post*, Sunday, February 6, 2005. (found in the Supplemental Materials)
- Baltimore Charter for Women in Astronomy (found in the Supplemental Materials)
- Rachel Ivie and Stacy Guo, "Women Physicists Speak Again," AIP Report, Publication Number R-441, April 2006. (Pages 9-12, section titled "Opinions About Physics") https://www.aip.org/statistics/reports/women-physicists-speak-again

Video

- Dr. Michal Lipson, 2010 MacArthur Fellow and Optical Society of America Fellow, speaks on "Subtle Discrimination" at the 2010 Minorities and Women in the Optical Society of America event. (42 minute-long video; teachers should stop the video at the 9:34 mark) http://www.osa.org/media_library/searchresultsvideo.aspx?Id=783711525001

Discussion Questions

Discussion Questions can be found as a Handout with a corresponding Answer Key in the Supplemental Materials to this lesson plan.

Documents Questions

1. What is subtle discrimination?
2. Give an example of how Drs. Urry and Lipson experienced subtle discrimination in their careers.
3. What were the motivations for issuing the Baltimore Charter?
4. What are some professional challenges women face, as described in the Baltimore Charter?
5. Describe a recommendation for changing the dominant scientific culture from the Baltimore Charter.

6. What was most surprising about the accounts of Drs. Urry and Lipson?
7. Why might some scientists be resistant to changing the dominant culture?
8. Have you ever experienced or witnessed subtle discrimination in class? How can we prevent this from happening?

AIP Statistical Research Questions

1. In "Women Physicists Speak Again," what was the top reason women gave for being discouraged about physics?
2. In the same report, what was the most agreed-upon aspect of physics that needs improvement?

Further Reading and Additional Resources

- Wertheim, Margaret. *Pythagoras' Trousers*: *God, Physics and the Gender Wars*. New York: Times Books, 1995.
- McGrayne, Sharon Bertsch. *Nobel Prize Women in Science: Their Lives, Struggles, and Momentous Discoveries*. New York: Carol Publishing, 1993.
- Schiebinger, Londa. *The Mind Has No Sex? Women in the Origins of Modern Science*. Cambridge, Mass. and London: Harvard University Press, 1989.
- American Institute of Physics, Statistical Research Center's reports on women in physics and allied fields: https://www.aip.org/statistics/women

Extensions

Related AIP Teacher's Guides on Women and Minorities in the Physical Sciences:

- Fair or Unfair: Should These Women Have Won a Nobel Prize?

Common Core Standards

For more information on Common Core Standards, visit http://www.corestandards.org/.

Speaking & Listening	
CCSS.ELA-LITERACY.SL.9-10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.9-10.2	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
CCSS.ELA-LITERACY.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.11-12.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the

	credibility and accuracy of each source and noting any discrepancies among the data.
History/Social Studies	
CCSS.ELA-LITERACY.RH.9-10.1	Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
CCSS.ELA-LITERACY.RH.9-10.2	Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
CCSS.ELA-LITERACY.RH.9-10.4	Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.
CCSS.ELA-LITERACY.RH.9-10.5	Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
CCSS.ELA-LITERACY.RH.9-10.6	Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.
CCSS.ELA-Literacy.RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.
CCSS.ELA-Literacy.RH.9-10.9	Compare and contrast treatments of the same topic in several primary and secondary sources.
CCSS.ELA-Literacy.RH.11-12.1	Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.
CCSS.ELA-LITERACY.RH.11-12.2	Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas
CCSS.ELA-LITERACY.RH.11-12.4	Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).
CCSS.ELA-Literacy.RH.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.
Subject Writing	
CCSS.ELA-LITERACY.WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.WHST.9-10.9	Draw evidence from informational texts to support analysis, reflection, and research.
CCSS.ELA-LITERACY.WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the

	strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
CCSS.ELA-LITERACY.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

Next Generation Science Standards

For more information on the Next Generation Science Standards, visit http://www.nextgenscience.org/.
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