RUTGERS
Graduate School of Education

Learning and Teaching
Graduate School of
Education
Rutgers, The State University of New
Jersey 10 Seminary Place
New Brunswick, NJ 08901-1183

848-932-0789
http://gse.rutgers.edu/

Rutgers, The State University of New Jersey
15:256:550:01 Biology and Society
Mon. 11:00am-2:00pm @ hybrid (mostly online)
Fall 2021, 3 Credits

Instructor: Ravit Duncan	Email ravit.duncan@gse.rutgers.edu
Phone Number : (848) 932 0792	Location: 10 Seminary Place; Room: 222
Office Hours: by arrangement	Prerequisites or other limitations: *Admission to the Teacher Education Program*
Mode of Instruction: ____Lecture __ Seminar X Hybrid ____Online ____Other	Permission required: _x_ No __Yes Directions about where to get permission numbers:

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This course addresses the following New Jersey Professional Standards for Teachers (2014):

Standard One: Learner Development .The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.

Standard Two: Learning Differences. The teacher uses understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards

Standard Four: Content Knowledge. The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches, particularly as they relate to the Common Core Standards and the New Jersey Core Curriculum Content Standards (NGSS for science) and creates learning experiences that make these aspects of the discipline accessible and meaningful for learners to assure mastery of the content.

Standard Five: Application of Content. The teacher understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.

Standard Eight: Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.

This course addresses the following 2020 NSTA Standards for Science Teacher Preparation

Standard 1: Content Knowledge. Effective teachers of science understand and articulate the knowledge and practices of contemporary science and engineering. They connect important disciplinary core ideas, crosscutting concepts, and science and engineering practices for their fields of licensure.

Standard 2: Content Pedagogy. Effective teachers of science plan learning units of study and equitable, culturally-responsive opportunities for *all* students based upon their understandings of how students learn and develop science knowledge, skills, and habits of mind. Effective teachers also include appropriate connections to science and engineering practices and crosscutting concepts in their instructional planning.

Standard 3: Learning Environments. Effective teachers of science are able to plan for engaging *all* students in science learning by identifying appropriate learning goals that are consistent with knowledge of how students learn science and are aligned with standards. Plans reflect the selection of phenomena appropriate to the social context of the classroom and community, and safety considerations, to engage students in the nature of science and science and engineering practices. Effective teachers create an anti-bias, multicultural, and social justice learning environment to achieve these goals.

Standard 5: Impact on Student Learning. Effective teachers of science provide evidence that students have learned and can apply disciplinary core ideas, crosscutting concepts, and science and engineering practices as a result of instruction. Effective teachers analyze learning gains for individual students, the class as a whole, and subgroups of students disaggregated by demographic categories, and use these to inform planning and teaching.

COURSE LEARNING GOALS[1]

— Students will be able to describe the processes by which scientists develop scientific knowledge, referencing core practices such as modeling and argumentation.

[1] These can be TEAC claims or objectives from other sources.

- Students will be able to develop working knowledge of the new science standards (NGSS) and use this knowledge to develop a vision for teaching inquiry in the classroom as well as a set of criteria that they will use to critique lesson plans.
- Students will develop working knowledge of core learning theories in science education (through readings and discussions).
- Students will begin to develop understanding of what culturally responsive teaching is and how science instruction can be responsive, consequential, and just for students.
- Students will develop a lesson plan that is aligned to the NGSS and illustrates science for social justice teaching.
- Students will analyze written work from middle and high school pupils in order to identify leverages and gaps in the pupils' reasoning.

COURSE CATALOG DESCRIPTION:

This course is an introduction to the nature of scientific knowledge and practice in the biological sciences and the implications for instruction. Science is about building models and theories to explain natural phenomena. It is about using observations and experimentation to construct evidence-based models that are creative, tentative, and in many ways subjective. These models are then subject to critique and argumentation by the scientific community. In this course we will learn about scientific inquiry and develop a vision of how an inquiry-based classroom operates.

We will therefore begin with an exploration of the nature of scientific inquiry in biology and why we should teach it. We will also examine the goals of biology education and related standards at the national and state level. During the course of the semester we will learn about inquiry-based approaches to science education that emphasize not only the learning of scientific concepts but also learning about the nature of scientific inquiry. You will also learn about ways to teach science that emphasize equity and justice with particular attention to the socio-political context of schooling and STEM education.

Academic integrity: Make sure that you provide proper citations for all materials that you use in all written work. Any violation of academic honesty is a serious offense and is therefore subject to an appropriate penalty. Refer to http://academicintegrity.rutgers.edu/ for a full explanation of policies.

GRADING POLICY:

Assignment	Tentative due date	Grade
Participation (individual)	Throughout the course	20%
Review of social justice issue in STEM (pair)	By week 13	15%
Lesson critiques (individual/pair)	Throughout the course	15%
Lesson development (individual)	Week 12	20%
Reflection paper (individual)	Week 15	15%

ASSIGNMENTS[2]:

Participation: Your participation in class counts heavily towards your grade. It is therefore important that you actively participate in class activities and discussions. Learning is an active process: the more you participate the more you learn. As part of your participation you are expected to read assigned readings, view assigned videos, actively engage in class discussion and group work activities. Because this is a small seminar it is critical for your own learning and the learning of your peers that you attend all classes,

[2] Including exams, papers etc.

arrive on time, and stay engaged throughout the class time. If you have to miss a class or be late for any reason, please contact me ahead of time. We will meet each week for three hours either on zoom synchronously or in person.

Readings: There will be assigned readings and videos for each class session; you are expected to read/view them and be prepared to discuss them in class (part of participation grade). Often, I will assign a question or two to guide and focus your thinking as you read/view the assigned papers/videos. On occasion an additional reading may be assigned or a new reading may be substituted for an existing one.

Review of social justice issue: A core goal of this course is to increase your sociopolitical awareness and knowledge of relevant history. Many of the readings and videos will focus on this aspect, as well as our class discussion. However, there is a lot of ground to cover and not enough time. Therefore, you will work in pairs to take a deep dive into an equity and social justice issue that is interesting to you and that specifically relates to STEM education (does not have to be only biology). You will be expected to increase your knowledge of this issue through your own research on the topic and then present a detailed analysis of the issue, as well as what can be done about it, to the class.

Lesson critiques. In order to develop skill at identifying important elements of good NGSS aligned lessons we will develop a list of criteria for good lessons which you will use to critique lessons. There will be several lesson/unit critique assignments throughout the course.

Lesson development. To begin developing your skills of instructional design you will design of a short lesson set (2-3 days of instruction) in which students have to either develop or evaluate models based on provided evidence. You will work to develop this activity based on "templates" that you will explore in class. Importantly, the lesson needs to relate to students' interests and must draw on students' lived experience and funds of knowledge. All lesson materials will be due by week 14.

Individual reflection paper: The last assignment of this course is an individual reflection paper ~5 pages long in which you will reflect on what you have learned in this course. This reflection should be based on the contribution of the readings, class activities, and assignments to your developing understanding of what it means to teach biology effectively.

Academic Integrity Policy: Please make sure to properly cite all academic sources (citations of articles, books, etc.) in your assignments.

COURSE SCHEDULE

Week 1[Sep 8 Wed] - Introduction
Subscribe to Scientific American http://www.sciam.com/

Begin reading: " We want to do more than survive" by Bettina Love (on Sakai). One chapter per week.

Week 2 [Sep 13]- What is Scientific Inquiry?
Donovan, M. J., & Bransford, J. D. (2005). *How Students Learn: Science in the Classroom*. Washington, DC: National Academy Press. Introduction and (1-21) Chapter 9 (397-416)

VIDEO- McIntosh (18min) – Privilege systems https://www.youtube.com/watch?v=e-BY9UEewHw

Week 3 [Sep 20]- The New Vision for Science Education

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas.* Washington, DC: National Academy Press. Page 1- 4 (Summary) and pg 23-37 (Chp 2)

Duncan, R. G, & Cavera, V. L. (2015). DCIs, SEPs, and CCs, Oh My! Understanding the Three Dimensions of the NGSS. Science Scope; 39 (2), p50 -54

Krajcik, J. (2015). Three-Dimensional Instruction: Using a New Type of Teaching in the Science Classroom. *Science and Children*, 53 (3), p6-8

VIDEO- DiAngelo (100 min)- White fragility –https://www.youtube.com/watch?v=HrOFpaB-PQI

Week 4 [Sep 27]- Scientific Models in the Classroom

Windschitl, M. (2008). What is inquiry? A framework for thinking about authentic scientific practice in the classroom. In Science as inquiry in the secondary setting. (pp. 1-20). Eds. Luft, J., Bell., Gess-Newsome, J. NSTA press, Arlington, Virginia.

Windschitl, M & Thompson, J. Teaching about science ideas as models. University of Washington (1-11)

VIDEO- Kendi (54min) -How to be an anti-racist
https://www.youtube.com/watch?v=TzuOlyyQlug&t=1487s
VIDEO -Conversations about race, watch at least 4, but NOT the Native American one (we all watch that later in the semester) https://www.nytimes.com/interactive/projects/your-stories/conversations-on-race

Week 5 [Oct 4]- Lesson Critique I

Rinehart, R., Duncan, R. G., & Chinn, C. A. (2014). A scaffolding suite to support evidence-based modeling and argumentation. *Science Scope*, 38(4), 70-77

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas.* Washington, DC: National Academy Press. Chp 3 (read half-- 41- 63)

VIDEO- Glad You Asked, Season 2- Does my neighborhood determine my future-
https://www.youtube.com/watch?v=pu2sKNJMH-k&list=PLJ8cMiYb3G5cOFj1VQf8ykNOI0ptuHybc&index=3
Is racism making people sick-
https://www.youtube.com/watch?v=Xk5pzLeHvdY&list=PLJ8cMiYb3G5cOFj1VQf8ykNOI0ptuHybc&index=5

Week 6 [Oct 11]- Introduction to MBI Lesson Design – Indigenous Peoples Day

Amy Harmon (2019). Can biology class reduce racism? New York Times.
https://www.nytimes.com/2019/12/07/us/race-biology-genetics.html (also as PDF on Sakai)

Dar-Nimrod, I., & Heine, S. J. (2011). Genetic essentialism: On the deceptive determinism of DNA. *Psychological Bulletin*, *137*(5), 800–818.

VIDEO- What plants can teach us (50 min – start after intros)-
https://www.nytimes.com/video/opinion/100000005352074/a-conversation-with-native-americans-on-race.html

A conversation with Native Americans on race (6min)- https://www.nytimes.com/video/opinion/100000005352074/a-conversation-with-native-americans-on-race.html
OPTIONAL-Genetic determinism, biological essentialism, and the naturalist fallacy https://www.youtube.com/watch?v=TU7V5eZ0Omk
Lesson Critique due

Week 7 [Oct 18]- MBI in the Classroom I
National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas.* Washington, DC: National Academy Press. Chp 3 (read rest of chapter)

VIDEO- Unnatural Causes (54min) https://unnaturalcauses.org/video_clips.php

Week 8 [Oct 25] – MBI in the Classroom II
National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas.* Washington, DC: National Academy Press. Pg 139-169 Life Science DCIs- read LS1& LS2.

VIDEO- Kimberly Crenshaw on intersectionality (18min)
https://www.youtube.com/watch?v=akOe5-UsQ2o
VIDEO- Invisible Women – Caroline Criado Perez (25min)
https://www.youtube.com/watch?v=hB92hQeCEAw
VIDEO- Sydney Chaffee (17min) https://www.youtube.com/watch?v=ziW5JG6GTHk

Week 9 [Nov 1]- MBI in the Classroom III
National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas.* Washington, DC: National Academy Press. Pg 139-169 Life Science DCIs, read LS3-4

VIDEO - Carol Anderson -White Rage (51min) - https://www.youtube.com/watch?v=YBYUET24K1c
Draft of Lesson Plan due

Week 10 [Nov 8]- Lesson Critique II
Todd Campbell, Christina Schwarz, and Mark Windschitl, "What we call misconceptions may be necessary stepping-stones toward making sense of the world," Sci. Teach. 83, 69–74

Delpit, L, D. (1988). The Silenced Dialogue: Power and Pedagogy in Educating Other People's Children. *Harvard Educational Review*. 58 (3), 280-299.

VIDEO- Lisa Delpit (60min) https://www.youtube.com/watch?v=RiC-2DYdjOI

Week 11 [Nov15]- Argumentation and Disciplinary Literacy
National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas.* Washington, DC: National Academy Press. Cross Cutting Concepts Pg, 83

Pearson, P. David, Elizabeth Moje, and Cynthia Greenleaf. (2010). Literacy and Science: Each in the Service of the Other. *Science*, 328 (5977): 459.

VIDEO - Elizabeth Moje- Disciplinary literacy (7min) http://www.aera100.net/elizabeth-moje.html

Lesson Critique 2

Week 12 [Nov 22] – Introduction to edTPA

Lucas, D., Broderick, N., Lehrer, R., & Bohanan, R. (2005). Making the grounds of scientific inquiry visible in the classroom. *Science Scope*, 29 (3), 39-42.

Reiser, B.J., Berland, L.K, & Kenyon, L**.** (2012). Engaging students in the scientific practices of explanation and argumentation. *Science Scope*, *35*, 6-11.

VIDEO --Harriet Washington Medical Apartheid
https://www.youtube.com/watch?v=3D7jDh0FHU8

Week 13 [Nov 29] – Introduction to Danielson

Discuss Dr. Bettina Love's book

VIDEO --Bettina Love- https://www.youtube.com/watch?v=J_sL_DbXjr8

Review Social Justice Issue

Week 14 [Dec 6]- Science Education for Social Justice

Allchin D. (2020) From Nature of Science to Social Justice: The Political Power of Epistemic Lessons. In: Yacoubian H.A., Hansson L. (eds) Nature of Science for Social Justice. *Science: Philosophy, History and Education*. Springer, Cham.

Windschitl, M. (January, 2006). Why we can't talk to one another about science education reform. *Phi Delta Kappan*. 87 (05), 348-355.

VIDEO- Naomi Oreskes -Why should we trust science?
https://www.ted.com/talks/naomi_oreskes_why_we_should_trust_scientists?language=en

VIDEO- Alex Edmans What to trust in a post truth world
https://www.ted.com/talks/alex_edmans_what_to_trust_in_a_post_truth_world?language=en

Final Lesson Plan due

Week 15 [Dec 13]- Final Class

No readings

Reflection paper due