RUTGERS
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Learning and Teaching
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Rutgers, The State University of New Jersey

11:300:450:01 and 15:256:550:01 **BIOLOGY AND SOCIETY**

Fall 2014
12:35-3:15 @ Waller Hall 209

Instructor: Ron Rinehart	Email ron.rinehart@gse.rutgers.edu
Phone Number : 848-932-0845	Location10 Seminary Place; Room: 319
Office Hours: 12 to 1pm Tuesdays or by arrangement	Prerequisites or other limitations: *Admission to the Teacher Education Program*
Mode of Instruction: ___ Lecture _x_ Seminar ___ Hybrid ___ Online ___ Other	Permission required: _x_ No __Yes Directions about where to get permission numbers:

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentations: hhttps://ods.rutgers.edu/students/documentation-guidelines. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: https://ods.rutgers.edu/students/registration-form.

Course Description

Learning goals:

New Jersey Professional Standards for Teachers (2014)[1]:

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 and creates learning experiences that make these aspects of the discipline accessible and meaningful for learners to assure mastery of the content.

[1] http://www.state.nj.us/education/code/current/title6a/chap9.pdf

ii. Essential Knowledge

(1) The teacher understands major concepts, assumptions, debates, processes of inquiry, and ways of knowing that are central to the discipline(s) he or she teaches.

(2) The teacher understands common misconceptions in learning the discipline and how to guide learners to accurate conceptual understanding.

iii. Critical Dispositions

(1) The teacher realizes that content knowledge is not a fixed body of facts but is complex, culturally situated, and ever evolving. He or she keeps abreast of new ideas and understandings in the field.

(4) The teacher is committed to work toward each learner's mastery of disciplinary content and skills.

(5) The teacher shows enthusiasm for the discipline(s) they teach and is committed to making connections to everyday life.

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.

ii. Essential Knowledge

(5) The teacher understands critical thinking processes and knows how to help learners develop high level questioning skills to promote their independent learning;

(6) The teacher understands communication modes and skills as vehicles for learning (for example, information gathering and processing) across disciplines as well as vehicles for expressing learning.

iii. Critical Dispositions

(1) The teacher is constantly exploring how to use disciplinary knowledge as a lens to address local and global issues.

(2) The teacher values knowledge outside his or her own content area and how such knowledge enhances student learning.

Council for the Accreditation of Education Professionals (2013)[2]:

Standard 1: Content and Pedagogical Knowledge

1.4 Providers ensure that completers demonstrate skills and commitment that afford all P-12 students access to rigorous college- and career-ready standards (e.g., Next Generation Science Standards, National Career Readiness Certificate, Common Core State Standards).

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. 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.

Other description of course purposes, context, methods, etc.:

[2] http://caepnet.files.wordpress.com/2013/09/final_board_approved1.pdf

This course is an introduction to the nature of scientific knowledge and practice in the biological sciences, and the implications for instruction. Science is knowledge-building endevour. 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 scientific practices involved in scientific knowledge building. Many course activities and assignments will involve group or pair work.

Course Structure and Assignments

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, actively engage in class discussion and group work activities.

Readings: There will be assigned readings for each class session; you are expected to read 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 the assigned papers. On occasion an additional reading may be assigned or a new reading may be substituted for an existing one. Each week two students will facilitate the discussion of the readings. This counts towards your participation grade.

Scientific article review: As a science educator you are expected to stay well informed of scientific developments in biology. Towards that end you are asked to subscribe (for the duration of one year and in your name) to Scientific American. During the course you will be expected to read and review a major article in this journal (from current or past issues). The review needs to identify the scientific model that is at the heart of the report, the evidence in support of the model and any counter-arguments. You will conduct a brief presentation on the article in class (PPT slides will be graded). I also recommend subscribing to Science News a weekly magazine with science updates in short articles that are great for the classroom.

Projects: There are two major activities in this course that will help you develop a better understanding of science, and begin to develop your ability to design effective instruction. The first is the inquiry project, which will be conducted throughout the semester. There will be intermediate milestones, such as a project proposal, that you are expected to complete (due dates TBD). Inquiry projects will be done in small groups (3 people). The project entails investigating a natural phenomenon, constructing and revising a model of that phenomenon based on tests of conjectural relationships and objects in the model. You will be expected to read scientific articles related to your project.

The second project- lesson critiques and revision- will be done partly in groups and partly individually. During several points in the course you will be asked to critique and revise an existing lesson. As a class we will develop criteria for judging the merits and shortcomings of inquiry-based lessons.

Individual reflection paper: The last assignment of this course is an individual reflection paper 3-5 pages long in which you (individually) reflect on what you have learned in this course. This reflection should be based on the contribution of the readings, class activities, and final project to your developing understanding of what it means to teach biology effectively.

Specific instructions for assignments (listed and not listed) will be provided in class closer to the assignment due date.

Post bacc students are required to complete a teaching philosophy paper for their portfolio as part of this course.

Required texts: subscription to Scientific American

Grading policy:

Academic Integrity Policy:
Any violation of academic honesty is a serious offense and is therefore subject to an appropriate penalty. Refer to http://academicintegrity.rutgers.edu/integrity.shtml for a full explanation of policies.

Web site: https://sakai.rutgers.edu/portal *(Specific course Sakai access will be available only to those students who have officially registered for this course.)*

Course Requirements

Attendance Policy Students are expected and required to attend all classes. I expect you to be on time for class. If you are going to be significantly late or need to leave early please contact me as soon as possible.

Summary of Requirements

Assignment	Tentative due date	Grade
Participation (individual)	Throughout the course	25%
Scientific article review (individual)	Throughout the course	10%
Inquiry project (group)	Week 14	30%
Lesson critiques (individual & group)	Throughout the course	20%
Individual reflection paper (individual)	Week 14	15%

Course Schedule by Week

Week	Topics to be Covered	Assignments & Readings
1: 9/8/14	• Introduction	• Subscribe to Scientific American http://www.sciam.com/ • Write Teaching Philosophy Paper for post bacc students (Due Sep 15)
2: 9/15/14	• Nature of Science I	• 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)
3: 9/22/14	• Nature of Science II	• Duschl, R. (1990) *Restructuring Science Education: The importance of theories and their development.* New York:Teachers College Press. Chapter 1 (1-13) • 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. • Lederman, N. G., & Lederman, J. S. (2004). Revising instruction to teach nature of science. *The Science Teacher*, 71 (9), 36-39 • Short inquiry project description due by Fri (Sep 26) @ 8pm
4: 9/29/14	• Nature of Science III	• 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. • Short inquiry project description due by due by Thurs (Sep 25) @ 8 pm
5: 10/6/14	• Lesson Critique I	• Windschitl, M & Thompson, J. Teaching about science ideas as models. University of Washington (1-11) • Lesson critique due Thurs (Oct 9) @ 8 pm
6: 10/13/14	• Extended Inquiry I	• Donovan, M. J., & Bransford, J. D. (2005). *How Students Learn: Science in the Classroom*. Washington, DC: National Academy Press. Chapter 12 (475-515) (read half) • Inquiry proposal due by Thurs (Oct 16) @ 8 pm
7: 10/20/14	• Extended Inquiry II	• Donovan, M. J., & Bransford, J. D. (2005). *How Students Learn: Science in the Classroom*. Washington, DC: National Academy Press. Chapter 12 (475-515)
8: 10/27/14	• Extended Inquiry III	• *Scientific American*, "Chromosomal Chaos and Cancer," by Peter Duesberg, May 2007, p. 52-59 [access online via library]. • Collins, H. M., & Pinch, T. J. (1993). The Golem: What You Should Know about Science. Cambridge, United Kingdom: Cambridge University Press. Read the chapter entitled: Edible knowledge: The chemical transfer of memory.

		• Revised proposal due Thurs (Oct 30) @ 8 pm
9: 11/3/14	• Lesson Critique II	• Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. Phi Delta Kappan, 80(2), 139-148. • Shavelson, R. J., Yin, Y., Furtak, E. M., Ruiz-Primo, M. A., Ayala, C. C., Young, D. B., et al. (2008). On the Role and Impact of Formative Assessment on Science Inquiry Teaching and Learning. In J. Coffey, R. Douglas & C. Stearns (Eds.), Assessing Science Learning (pp. 21-36). Arlington, VA: NSTA Press. • Lesson critique due Thurs (Nov 6) @ 8pm
10: 11/10/14	• Inquiry Project Interlude and the Evolution Debate	• Scott, E. C., and Matzke, N. (2007). "Biological design in science classrooms." Proceedings of the National Academy of Sciences. 104(suppl. 1), 8669-8676. May 15, 2007. Part of the v. 104 supplement, "In the Light of Evolution I: Adaptation and Complex Design." • Mirsky, S. (2006 Feb). Teach the Science. Scientific American. http://www.scientificamerican.com/article.cfm?id=teach-the-science
11: 11/17/14	• Model-Based Inquiry in the Classroom I	• Tang, X., Coffey, J., Elby, A., & Levin, D.M. (2010). Scientific inquiry and scientific method: Tensions in teaching and learning. *Science*

		Education, 94 (1), 29-47
12: 11/24/14	• Model-Based Inquiry in the Classroom II	• Passmore, C. & Stewart, J. (2002). A modeling approach to teaching evolutionary biology in high schools. *Journal of Research in Science Teaching*, 39(3), 185-204. • Inquiry proposal with preliminary results due Thurs (Nov 20) @ 8 pm
13: 12/1/14	• Model-based inquiry in the classroom III	• Windschitl, M. (January, 2006). Why we can't talk to one another about science education reform. *Phi Delta Kappan*. 87 (05), 348-355.
14: 12/8/14	• Technology interlude	• No readings • Inquiry paper due December 11 @ 8 pm
15: 12/15/14	• Inquiry Poster Fair	• Poster fair of inquiry projects • Poster fair of inquiry projects