

Macaulay Honors College Seminar 3 - Science and Technology in NYC Fall 2014

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Course Description

This is a skills-based course that will focus on scientific thinking. The goal of this course is to have students develop their Science Sense.

Science Sense is...

- being able to distinguish science from non-science.
- the ability to recognize how people collect and process facts into knowledge.
- the ability to recognize how a collection of facts becomes knowledge
- being able to question and evaluate information that is presented as scientific
- being an informed consumer, evaluator, and practitioner of science

We will focus on the specific skills that allow one to have good Science Sense. These skills fall into broad categories: Number Sense, Data Sense, and Knowledge Sense.

This course also will focus on the confluence of Science, Technology and Mathematics (STEM disciplines) and issues of civic importance. We will examine the issues of plastic marine debris, urban biodiversity and climate change from a variety of viewpoints, use our own authentic data to inform the issue of plastic debris at the local scale, and think about how data can guide civic action to solve problems.

Student Learning Outcomes

- Students will hone their Science Sense during this course. Specifically:
 - Students will acquire a proper sense of scale and be able to make order of magnitude estimates with reasonable assumptions.
 - Students will understand and get experience with measurement and data collection through activities in the field and be able to create and communicate their results using graphs and basic statistics.
 - Students will become familiar with proper experimental design and the practice of scientific inquiry.

- Students will understand that science makes progress and changes through time based upon newly available evidence.
- Students will practice their critical thinking skills and employ reasonable skepticism.
- Students will learn how to communicate science to different audiences.
- Students will leave this course with an appreciation for the similar set of skills employed by scientists in seemingly disparate fields of scientific inquiry.

Course Structure

The course will be a mix of mini lectures, discussions, field excursions and workshops, including time in a computer laboratory as necessary. There will be collaborative assignments as well as individual contributions. The semester will be broken up into topical units (urban biodiversity, plastic debris, climate change) that will include both general science topics (e.g. the nature of science, science information literacy, science methods) and specific topical information. In addition, there will be projects and other activities that are designed to help you develop your Science Senses.

Assignments and Grading

Assignments include both individual and group work. You are expected to complete all assignments on time. A brief description of the assignments are below. Detailed instructions and basis for grades will be provided during the semester.

Marine Plastics Project (55%): We will spend a significant portion of the semester researching the issues of marine plastics, including collecting authentic data, and presenting our findings in a variety of formats. The

- Plastics PSA Video (20%): Your team will create a 3-5 minute long PSA video about plastic debris in marine ecosystems. The videos will be based on the class' research and data. The American Littoral Society will view the videos and use their favorite to raise public awareness of the issue.
- Plastics survey (neighborhood) (20%): You team will design a plastic survey protocol to collect data on the amount of plastic trash found in neighborhoods around NYC. We will select the best and in groups of two, you will use it to conduct a plastic survey. The results will be displayed using Google Earth, and the protocols will be used by a local public school to conduct their own survey.
- Plastics survey (shoreline) (15%): We will collect data on the plastic debris found at Plumb Beach in Brooklyn using a scientific protocol adapted from the National Oceanic Administration's Marine Debris program. Results will be used in the end of semester poster presentation and in the PSA videos.

Poster (10%): At the end of the semester, teams will present a poster at the Macaulay poster session using the results from the semester long investigation into marine plastics.

Writing Assignments (30%): Every week, there will be some type of short reflective writing assignment. These will include blog posts and rapid reflections. The breakdown is as follows:

- Bioblitz Blog Posts (5%): Each student will make one individual contribution to the class blog with posts about the Bioblitz that will present the results and discuss their importance and limitations. Students will also be required to post comments on other students' blog posts.
- Marine Plastics Blog Posts (10%): Each student will make two individual contributions to the class blog with posts about our research on marine plastics, including reports on our field excursions. Students will also be required to post comments on other students' blog posts.
- Reflections and comments (15%): Each student will keep a reflective journal for recording their thoughts and reactions about the class and about blog posts. These rapid reflections will typically be five minutes of writing at the end of class. Occasionally, the reflections will take the form of comments on the class blog posts. The full 15% is earned by completing at least 15 substantive reflections/blog comments as assigned by me.

Your letter grade will be based on your final cumulative percentage as follows:

A+ (98 - 100), A (93 - <98), A- (90 - <93), B+ (87 - <90), B (83 - <87), B- (80 - <83), C+ (77 - <80), C (73 - <76), C- (70 - <73), D+ (67 - <70), D (63 - <67), D- (60 - 63), F (<60)

Reading/Video Assignments

Classes will often be based on assigned readings and videos. It is import to complete them prior to class. The reading/video assignments will be posted on the course e-Portfolio site at:

<http://macaulay.cuny.edu/eportfolios/branco2014/>

It is your responsibility to check the site for assignments

General Course Outline – subject to revision as semester progresses

Class #	Date	Topic
1	08/28/14	Course Introduction: What is Science?
2	09/02/14	Discussion: What is Science? ; Plastics at sea: The discovery
3	09/04/14	What is a Bioblitz? Is it science”?
4	09/09/14	Biodiversity and scientific indices
5	09/11/14	Workshop: Bioblitz data
6	09/16/14	The plastisphere: Marine plastics as ecosystems
7	09/18/14	Did BPA kill the lobsters in Long Island Sound?
8	09/30/14	The BPA controversy: What to believe?
9	10/02/14	Workshop: Making a video
10	10/07/14	Impacts of marine plastics
11	10/09/14	Workshop: Design a data collection protocol (shoreline plastics or neighborhood plastics)
12	10/14/14	Impacts of marine plastics
13	10/16/14	Field Trip Comp Day (Prof. Branco at the New England Estuarine Research Society meeting)
14	10/21/14	Workshop: Data collection protocol critique and revision
15	10/23/14	Why is plastic trash a “wicked problem” that science alone can't solve?
16	10/28/14	Workshop: Plastic data workup
17	10/30/14	Workshop: Geospatial data in Google Earth
18	11/04/14	Climate and NYC: Sea level rise

19	11/06/14	Climate and NYC: The problem with scales
20	11/11/14	Climate and NYC: Are models reliable?
21	11/13/14	Workshop: Making a poster
22	11/18/14	Climate and NYC: Science and politics (or: Why are we getting our climate information from Al Gore and the Heartland Institute?)
23	11/20/14	Poor Wegener (Science is not perfect - Part I)
24	11/25/14	You didn't measure it right (Science is not perfect - Part II)
25	12/02/14	Poster drafts and critiques
26	12/04/14	Workshop: Design your own experiment
27	12/09/14	Workshop: Design your own experiment – peer review
28	12/11/14	Final thoughts and critique