

## IDST 89.002

### From Laboratory to Layperson: Scientific Literacy and Communication

Spring Semester 2018  
Tuesday/Thursday, 2:00pm-3:15pm  
Classroom: Woolen Gym 301

#### Instructors

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**COURSE DESCRIPTION:** Scientific literacy is defined as “*The knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity.*” The United States has long been considered a prominent driver of scientific innovation and progress, but insufficient scientific literacy among the American population has become a major topic of interest in recent years. Notable American scientists such as Neil deGrasse Tyson have described scientific illiteracy as “a threat to the nation,” with critical economic and political implications in the U.S. and abroad. While many American companies and agencies continue to drive scientific innovation, the Pew Research Center ranks U.S. students 24th in scientific literacy, and major political and public policy debates are commonly permeated by science denialism and widespread difficulty separating objective truths from “alternative facts.”

Scientific literacy is a critical cornerstone for growth and progress in economic, intellectual, and policy matters worldwide. This course seeks to provide students of all academic backgrounds and interests with an understanding of scientific literacy by exploring how science is done, communicated, and understood by the public. Science is a process that is applied in many forms. The course therefore takes an interdisciplinary approach that integrates basic, observational, and applied sciences, drawn from the course instructors’ respective disciplines of exercise and sport science, nutritional epidemiology, and computational physics. Students will explore foundational concepts relating to logic, reasoning, communication, and critical evaluation of evidence, which will provide them with skills that apply to a variety of fields and concepts.

#### **COURSE OBJECTIVES:**

The current course will equip students with the knowledge and skills necessary to:

1. Identify the theoretical/philosophical basis of scientific inquiry
2. Obtain an understanding of the current scientific climate
3. Evaluate how scientific findings are communicated to academics and specialists
4. Evaluate how scientific findings are translated and communicated to the lay public
5. Locate, access, and critically evaluate peer-reviewed research articles

6. Critically review lay press articles and sources with regard to their rigor and accuracy
7. Compare and contrast academic and non-academic communication styles
8. Critically evaluate a peer's writing and provide constructive feedback
9. Revise a written piece to incorporate constructive feedback from instructors and peers
10. Actively participate in engaging, interdisciplinary scientific discussions as a class and in small-groups

### **READING ASSIGNMENTS:**

There is no required textbook; readings will be provided to students. Readings should be completed *prior* to the class for which they are assigned, and will form the basis for our class discussion. As such, it is critical that students actively keep up with reading assignments, all of which will be posted to the course Sakai page.

Readings include a combination of peer-reviewed research papers, popular science articles, and scientific communication articles. Reading questions will be provided for each reading assignment, and students are expected to answer all questions and keep a written journal of responses.

### **COURSE EXPECTATIONS**

All students are expected to come prepared to class ready to engage in thoughtful discussion, while also maintaining a supportive learning classroom environment. Students will work in small (4-6 students) groups for the duration of the semester, and are expected to participate actively in discussions and activities within their small groups to foster an engaging, supportive learning environment. Students who fail to participate in discussion or who are not adequately prepared for class will receive fewer participation points. No laptops or cellphones are allowed in class without exemption from University Accessibility Resources & Services.

Students are expected to turn in assignments by the listed due dates. Late work will receive a 10-point deduction for each day it is late. Regrading requests must be made within one week of returned graded assignments. Requests must be made in writing: clearly state reasons why you are requesting the review (cc all instructors in an email). Instructors reserve the right to review entire assignments, so be aware that points may be lost elsewhere. Students are expected to work independently on all graded assignments, and plagiarism will not be tolerated. For definitions and further information regarding plagiarism and improper assistance on assignments, please see the UNC web page for student conduct:

<https://studentconduct.unc.edu/>

The University of North Carolina at Chapel Hill has had a student-led honor system for over 100 years. Academic integrity is at the heart of Carolina and we all are responsible for upholding the ideals of honor and integrity. The student-led Honor System is responsible for adjudicating any suspected violations of the Honor Code and all suspected instances of academic dishonesty will be reported to the honor system. Information, including your responsibilities as a student, is outlined in the Instrument of Student Judicial Governance. Your full participation and observance of the Honor Code is expected.

### **ATTENDANCE POLICY**

*Attendance is mandatory.* You are expected to be on time for and remain in class for the duration of that class period, unless you notify the instructors of extenuating circumstances

ahead of time. Attendance is taken each class, so being late or missing class will influence your participation grade. Point deductions begin with the second unexcused absence and beyond.

Excused absences are those that are approved by the University Administration and the instructors, and cannot be granted without a written documented excuse.

**SPECIAL ACCOMMODATIONS:**

Any students that may require special accommodations (due to a physical or learning disability) should schedule a meeting with the one of the instructors during the first week of class. If, during the course of the semester, new or different accommodations are required, the student is responsible for notifying the instructors in a timely fashion. You may visit the following sites for more information on the University Disability Services (<http://disabilityservices.unc.edu>) or Learning Disability Services (<http://www.unc.edu/depts/lids>). The instructors will work with both departments to ensure that appropriate alterations in coursework, examinations, and lab activities are made for students with a documented disability.

**CHANGES TO THE SYLLABUS:**

The instructors reserve the right to make changes to the syllabus, including project due dates and readings. Any changes will be announced as early as possible.

## Course Schedule

Date	Topic	Readings Due	Assignments
Thursday 1/11	Introduction to course	None	
Tuesday 1/16	Philosophy and history of science	"What is philosophy of science (and should scientists care)?" <i>Scientific American</i>	
Thursday 1/18	Visit the Morehead Planetarium and Science Center	None	*assign: read a lay press article and analyze it
Tuesday 1/23	The early scientists and the scientific method	"The Scientific Method," <i>Khan Academy</i> (Video) <i>The Road to Reality</i> , Roger Penrose - chapter 1	
Thursday 1/25	Case study: paradigms and the scientific method	None	*due: read a lay press article and analyze it
Tuesday 1/30	Epistemology, logic, reasoning, logical fallacies	Selection from Hume, <i>Enquiry Concerning Human Understanding</i> , sections 4 and 5 "10 steps for evaluating scientific papers." <i>The Logic of Science</i> .	
Thursday 2/1	Tour EXSS Labs	Validity and reliability of a 4-compartment body composition model using dual energy x-ray absorptiometry-derived body volume (2017). AE Smith-Ryan, et al.	
Tuesday 2/6	Measurement, variability	Reproducibility and Validity of A-Mode Ultrasound for Body Composition Measurement and Classification in Overweight and Obese Men and Women (2014). AE Smith-Ryan, et al.	
Thursday 2/8	Validity, reliability	Review readings from 2/1 and 2/6	*assign: read an academic article and analyze it
Tuesday 2/13	Replication in science	Baker, "Psychology's reproducibility problem is exaggerated – say psychologists." <i>Nature.com</i> .	
Thursday 2/15	Observational data (where does it come from?), causality	Justin Esarey, "Causal inference with observational data"  Youtube: "Observational study vs. Experiment," <i>Steve Mays</i>	
Tuesday 2/20	Writing styles: academic vs. non-academic	Joselita T. Salita, "Writing for lay audiences: A challenge for scientists."	
Thursday 2/22	Writing styles: academic vs. non-academic	"A Glass of Red Wine Is The Equivalent To An Hour At The Gym, Says New Study." <i>Huffington Post</i> .	*due: read an academic article and analyze it

		Improvements in skeletal muscle strength and cardiac function induced by resveratrol during exercise training contribute to enhanced exercise performance in rats (2012). Vernon W. Dolinsky, et al.	
Tuesday 2/27	Statistical inference	Troels C. Petersen, "Lady Tasting Tea."  Youtube: "Lady Tasting Tea - Inferential Statistics and Experimental Design," <i>Chang School</i> ; "Hypothesis tests, p-value - Statistics Help," <i>Statistics Learning Centre</i> .	
Thursday 3/1	The peer review process	"The peer review process." <i>Wiley Author Services</i> .  Publishing your work in a journal: Understanding the peer review process (2012). Voight & Hoogenboom.  "Is the staggeringly profitable business of scientific publishing bad for science?" <i>The Guardian</i>	
Tuesday 3/6	Bias	Pannucci, C. J., & Wilkins, E. G. (2010). Identifying and Avoiding Bias in Research. <i>Plastic and Reconstructive Surgery</i> , 126(2), 619–625. <a href="http://doi.org/10.1097/PRS.0b013e3181de24bc">http://doi.org/10.1097/PRS.0b013e3181de24bc</a> Bias in Research, Sandra Burge. <a href="http://familymed.uthscsa.edu/facultydevelopment/elearning/biasinresearch.htm">http://familymed.uthscsa.edu/facultydevelopment/elearning/biasinresearch.htm</a>	
Thursday 3/8	Comparing conclusions: The researcher vs. the popular press	Review: "10 steps for evaluating scientific papers." <i>The Logic of Science</i> .  Review readings from 2/27	*assign: final paper
Tuesday 3/13	**SPRING BREAK **	n/a	
Thursday 3/15	**SPRING BREAK **	n/a	
Tuesday 3/20	Evaluating sources of information	For journal articles: Critical appraisal of scientific articles (2009). du Prel et al.  For media and books: "Evaluating Sources: Overview." Purdue Online Writing Lab.	
Thursday 3/22	Tour of Castillo Lab (Climate Change Research)	"Warming Bleaches Two-Thirds of Great Barrier Reef" <i>National Geographic</i>  "Coral Reefs Under Rapid Climate Change and Ocean Acidification" <i>Science</i>	*assign: pick a "controversy" and analyze the argument from both sides

Tuesday 3/27	Current science "conspiracy theories" and controversies	"Why does the vaccine/autism controversy live on?" <i>Discover Magazine</i> "Science vs. Vaccines" <i>Science Vs</i>	
Thursday 3/29	Visit the Morehead Planetarium and Science Center	None	
Tuesday 4/3	Ethical considerations - academic (research)	Corporate funding of food and nutrition research: Science or marketing? (2016) M Nestle.  Meg Bernhard. "A clinician, a blogger, and now a thorn in Coca-Cola's side." <i>The Chronicle of Higher Education</i> .	
Thursday 4/5	Ethical considerations - non-academic (popular press)	James Hamblin. "The Food Babe: Enemy of Chemicals." <i>The Atlantic</i> .	*due: pick a "controversy" and analyze the arguments on both sides
Tuesday 4/10	Science Communicator Panel	None	*due: draft 1 of final paper, *assign: peer review
Thursday 4/12	Threats to scientific literacy	"Paths to acceptance. The advancement of scientific knowledge is an uphill struggle against 'accepted wisdom'" <i>European Molecular Biology Reports</i> , (2008) 9, 416-418	
Tuesday 4/17	Distrust of science/scientists	"Why do so many reasonable people doubt science?" <i>National Geographic</i>  "Americans' increasing distrust of science - and not just on climate change" <i>The Washington Post</i>	
Thursday 4/19	Peer Review Workshop	Review readings from 3/1	*due: peer review
Tuesday 4/24	Facilitating scientific literacy: Why and How	None	
Thursday 4/26	Translating science to policy: U.S. and Abroad	None	*due: final paper

### **GRADING SCALE**

A = 100 – 93%

A- = 92.99 – 90%

B+ = 89.99 – 87%

B = 86.99 – 83%

B- = 82.99 – 80%

C+ = 79.99 – 77%

C = 76.99 – 73%

C- = 72.99 – 70%

D+ = 69.99 – 67%

D = 66.99 – 60%

F = <59.99%

### **COURSE GRADES**

Evaluate a peer-reviewed article

Evaluate a lay press article	15 pts
Discuss a current “controversy”	15 pts
Comparison paper (Final Paper)	20 pts
Peer review of comparison paper	30 pts
Participation	10 pts
<b>Total</b>	<b>100 pts</b>

### **ASSIGNMENT INSTRUCTIONS:**

#### **Peer-reviewed article**

*Choose a peer-reviewed scientific article of interest and review what they did, what it means, and how it might be conveyed to the public. (2 pages)*

#### **Lay press article**

*Choose a lay press article and review its rigor, accuracy, reliability of sources, and whether or not it is effectively conveying the science to the public. (2 pages)*

#### **Current controversy discussion**

*Pick a scientific topic in the news. Discuss the two sides of the argument, and why you think the controversy persists. (3-4 pages)*

#### **Compare lay press vs. academic article on same topic (Final paper)**

*Find a lay press article about a journal article. Compare/contrast their conclusions. Did the lay press article convey the info effectively? Would you have communicated the science differently? If so, how? (4-6 pages)*

#### **Peer-review of final papers**

*Review the lay press vs. academic paper of a peer and provide written feedback. Students will also receive feedback on their first draft from the course instructors.*

#### **Participation**

*Students will be expected to come to class sufficiently prepared to actively participate in a variety of whole-class and small-group discussions and activities while maintaining a supportive, interdisciplinary learning environment. This includes completing reading journals with responses to prompts given by instructors.*