Scientific Writing and Communication in the Life Sciences

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Office Hours: Wednesday 10-11am, or by appointment.

Course Description:

Writing is a critical part of the scientific research process. Publishing results that influence others and writing proposals that get funded are essential to success in science. Unfortunately, scientists often lack strong training as writers. This course, designed for science majors, will focus on the fundamentals of effective written and oral communication in the sciences. We will review the principles of clear, concise, persuasive writing, and apply these principles to writing for a scientific audience. Students will critically evaluate the writing found in published literature, refine their understanding of the structure and style of scientific research papers, learn the basics of writing grant proposals, engage in peer review activities, and develop abilities for clear and engaging presentations. This course would be a good choice for students considering graduate school, or for any student who wants to become a more effective and confident scientific writer. Note that in depth discussion of scientific content and methodology is outside the scope of this course. Our focus will be on evaluating and revising the writing we encounter in the existing scientific literature and our own scientific writing.

Learning Objectives:

Upon completion of this course, students will:

- Approach their scientific writing as "writers," employing rhetorical principles to improve their writing's clarity, concision, and flow.
- More effectively communicate scientific information to multiple audiences both within and outside of the discipline.
- Understand the components of a typical scientific research paper and the process of writing and publishing scientific manuscripts.
- Become comfortable with critically reviewing the existing scientific literature, the work of their peers, and their own work.
- Develop an effective process for editing their scientific writing, and the writing of others.
- Learn the components of a typical grant proposal and how to write compelling grant proposals.

Required Texts:

Joshua Schimel, *Writing Science: How to Write Papers that Get Cited and Proposals that Get Funded*. Oxford University Press 2011. ISBN: 978-0-19-976024-4

Additional required readings will be posted on the course Canvas site

Attendance Policy:

Students are expected to attend all class meetings. If you are unable to attend a class meeting due to illness, emergency, or participation in a college-sanctioned activity, please notify me as soon as possible via email. After two absences, each absence will result in a one grade point decrease in your final grade (e.g. if you earned an A- in the course, but missed three classes, you will receive a B+. If you missed four classes, you will receive a B).

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the term to discuss appropriate accommodations.

x-hours:

I reserve the right to schedule an x-hour at any time. Please leave these times open in your schedule.

Students with Disabilities:

Students with disabilities who may need disability-related academic adjustments and services for this course are encouraged to see me privately as early in the term as possible. Students requiring disability-related academic adjustments and services must consult the Student Accessibility Services office (205 Collis Student Center, 646-9900, Student.Accessibility.Services@Dartmouth.edu). Once SAS has authorized services, students must show the originally signed SAS Services and Consent Form and/or a letter on SAS letterhead to their professor. As a first step, if students have questions about whether they qualify to receive academic adjustments and services, they should contact the SAS office. All inquiries and discussions will remain confidential.

Academic Honesty:

You are welcome to discuss course readings, topics, and assignments with your classmates, but all your writing must be your own work. If you use ideas, quotations, or information from another person, you must cite that source in your paper. Using the ideas or words of others without giving credit for those ideas is plagiarism, and will result in a failing grade for the course.

For further discussion of what constitutes plagiarism, and how to use and cite sources, please see Dartmouth's excellent document on Sources and Citations:
http://writing-speech.dartmouth.edu/learning/materials/sources-and-citations-dartmouth

Other Notes:

- I will not grant extensions on deadlines for the first drafts of assignments. We will do peer review activities in class on the day that these first drafts are due, and you will miss out on valuable feedback on your work if you do not have a draft with you. You will be permitted one extension on an assignment due date (for a revision or final draft) if necessary, and you need to discuss this with me ASAP so we can agree on an extended due date. All other late assignments will count against your participation grade (one point per day late). Aside from your one permitted extension, I will not be able to provide any comments on drafts that are more than 2 days late, and I will take two points off your grade for each day beyond the final draft deadline.

- For every assignment, please bring a printed copy to class in addition to submitting your paper online. All work should be word processed, 12 point font, double spaced, with standard margins. Please save your work frequently to avoid the heartbreak of losing work when computers malfunction!

- Do not throw away any of your work during the term! You are expected to save all drafts of your work. Please purchase a pocket folder for this course to keep all your written work in one place. Bring this folder to class each meeting, as we will be using your writing samples in our writing workshops.

- Please come to class on time. If you are more than 15 minutes late, you will be marked as absent.

- Please turn off your cell phones during class.

Writing resources:

The Student Center for Research, Writing, and Information Technology (RWiT): http://writing-speech.dartmouth.edu/learning/support-writing-research-and-composing-technology/rwit provides free tutoring on all issues pertaining to writing, research and more.

The Dartmouth Institute for Writing and Rhetoric: http://writing-speech.dartmouth.edu/learning provides many pages of excellent information and advice for students.

Academic Skills Center: http://www.dartmouth.edu/~acskills/ Provides tutors and counseling on academic issues.

Grading:

Participation/Engagement (Discussions, Peer Review, Exercises, etc…) – 10%
Critical Review – 10%
Abstracts (one on a given research paper, one on your own work) – 10%
Short Article on your Research – 20%
Writing for the Public practice exercise – 5%
Short Article for the Public – 15%
Grant Writing – 15%
Presentation – 10%
Digital Portfolio – 5%

Grade Scale:

A 100-95%	**B-** 82-80%	**D+** 69-67%
A- 94-90%	**C+** 79-77%	**D** 66-63%
B+ 89-87%	**C** 76-73%	**D-** 62-60%
B 86-83%	**C-** 72-70%	**F** 59-0

Descriptions of Assignments:

Critical Review of a Published Article

Students will choose a piece of primary literature from a top tier scientific journal (e.g. Science, Nature, Proceedings of the National Academy of Sciences, Proceedings of the Royal Society of London Series B), and will write a brief summary and critical analysis of their chosen article.

Scientific Research Paper

We will discuss the types of scientific journal articles, how to assess them for quality, and the process by which scientists publish their research. We will then review the various sections of a scientific research paper – Abstract, Introduction, Methods, Results, and Discussion – and look at examples of effective and ineffective writing for each section. Students will write a short research article on their own research or a hypothetical research question and/or dataset (provided by me, by the student's faculty advisor, or other faculty member in the student's department). Unlike in a science class, where students may write scientific papers but rarely have the chance to really refine and revise their writing, we will spend significant time both within class and outside of class on refining these scientific papers. We will workshop student writing in the classroom, revise writing samples in groups, engage in peer review activities, and develop skills for self-revision. Topics will include article structure and flow, paragraph and sentence structure, science as storytelling and grabbing the reader's attention, writing synthetic introductions and discussions, presenting information clearly and concisely, and clearly representing the significance of the study.

Exercises – Analyzing Writing in Published Papers

We will focus on selected published papers, and revisit these papers weekly as we work through the exercises in *Writing Science* by Joshua Schimel. We will evaluate how the authors tell their story and whether it is effective, and we will revise paragraphs, sentences, and passages for flow, concision, word choice, etc… Much of our discussion of these papers will be in class or in small groups. We will not discuss scientific content, unless it is relevant to our discussions of the writing.

Grant Writing

We will discuss how to find funding opportunities for your research, types of grants available, and how to write a compelling grant application. Reading assignments will include articles and book chapters on writing successful science proposals, as well as successful grant applications. Students will use the National Science Foundation Graduate Research Fellowship application as a guide and write their own personal statement, using the guidelines for this specific fellowship program. We will again re-write and refine our writing for clarity, flow, and structure.

Writing for the Public

In addition to explaining our research to scientists both within and outside of our fields, it is becoming essential that we can also explain our work to the general public. We will do a short practice exercise where you distill a published scientific article into a one paragraph "story." You will also write a longer piece, either on your own research (preferable) or on a published article. These will be done in a journalistic style and are meant to appeal to an educated but non-scientific audience. NOTE that for your longer story, if you would like to present this information as a podcast rather than a written piece, I would love to work with you on using Audacity (free software) to do so.

Presentation

Each student will do an oral presentation on the scientific research paper that they have written. We will have a class discussion on what makes an effective presentation and develop a grading rubric together. Students will then grade their peers on their presentations. We will discuss presentation style, effective graphics, and fitting it all in when time is limited.

Digital Portfolio

As part of your course grade, you will curate a digital professional portfolio including (some of) your work from this course, and other relevant work. You can choose the audience that is most appropriate for you at this point in your scientific career, e.g. early in your career, maybe you want to curate and reflect on your work as a way to make connections among your various experiences and develop your academic identity; later in your career, you might want a "showcase" portfolio that you could send to

potential employers or graduate schools. The choice is yours, as I am hoping your digital portfolio can grow and develop with you as is appropriate. For this course, I would like you to have an "About Me" section that is appropriate for your chosen audience, and I would like you to post your Research Story and Article for the Public. If you have any other relevant work – poster presentations, conference abstracts, multimodal work, you should feel free to post that as well.

Schedule: MWF 12:50-1:55, x-hour Tuesday 1:20-2:10.

Week	Day	Discussion Topic	Reading	Writing/Assignments
1	**M 3/25**	Introduction		
	W 3/27	Research and Synthesis		
	F 3/29	Journal Articles and Peer Review Process	See Canvas site	Bring a copy of the paper you intend to write your Critical Review on
2	**M 4/1**	Peer Review Workshop		CRITICAL REVIEW DRAFT DUE
	W 4/3	Science as Storytelling Digital Portfolio Introduction	Schimel Ch. 1-4 Hillier et al. 2016	
	F 4/5	Finding Your Story		
3	**M 4/8**	Scientific Paper - Introductions	Schimel Ch. 5-7	RESEARCH STORY DRAFT DUE
	W 4/10	Scientific Paper - Introductions 2		
	F 4/12	Scientific Paper - Methods/Results	Schimel Ch. 8	**CRITICAL REVIEW FINAL DUE** SAMPLE METHOD DUE
4	**M 4/15**	Grant Writing 1		
	W 4/17	Grant Writing 2	NSF GFRP samples	
	F 4/19	Scientific Paper - Figures/Tables		FIGURE with LEGEND DUE
5	**M 4/22**	Peer Review Workshop		PERSONAL STATEMENT DRAFT DUE
	W 4/24	Scientific Paper - Discussions	Schimel Ch. 9	
	F 4/26	Abstracts & Titles 1	Hoffman Chapter	ABSTRACT and TITLE for sample research paper DUE
6	**M 4/29**	Abstracts & Titles 2		ABSTRACT and TITLE for YOUR research story DUE
	W 5/1	Internal Structure & Paragraphs	Schimel Ch. 10-11	
	F 5/3	Sentences & Flow	Schimel Ch. 12-13	**PERSONAL STATEMENT FINAL DUE**
7	**M 5/6**	Energizing Writing & Words	Schimel Ch. 14-15	Anti-jargon exercise due
	W 5/8	Concision 1	Schimel. Ch. 16-18	
	F 5/10	Concision 2		**FINAL BIRD ABSTRACT DUE**
8	**M 5/13**	Oral Presentations	TBA	RESEARCH STORY REVISION DUE (including Abstract)
	W 5/15	Writing for the Public 1	Schimel Ch. 19-21	MESSAGE BOXES DUE (Exercises 20.1 and 20.2)

	F 5/17	Writing for the Public 2	TBA	Writing for the public practice paragraph due.
9	**M 5/20**	Peer Review Workshop		ARTICLE FOR THE PUBLIC DRAFT DUE
	W 5/22	Poster Presentations		
	F 5/24	Portfolio Showcase		**FINAL RESEARCH STORY DUE**
10	**M 5/27**	MEMORIAL DAY – NO CLASS		
	Tu(x) 5/28	**PRESENTATIONS**		
	W 5/29	**PRESENTATIONS**		
11	**F 5/31**	NO CLASS		**FINAL ARTICLE FOR THE PUBLIC DUE** **DIGITAL PORTFOLIO DUE**