WRITING IN SCIENCE AND TECHNOLOGY

WRITING 44.02 **SPRING 2019**
BERRY 370 **10A: T/TH 10:10 AM-12:00 PM**
X-HOUR: W 3:30-4:20

INSTRUCTOR: Professor Rachel Obbard
OFFICE: 304 North Fairbanks
EMAIL: Rachel.W.Obbard@dartmouth.edu
PHONE: mobile: 60328 60328

OFFICE HOURS: T/Th 12-2 and by appointment

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

Husain, Tasneem Zehra. *Only the Longest Threads*. Paul Dry Books (publisher). 2014. ISBN 978-1589880887

OTHER RECOMMENDED TEXTS

Williams, Joseph. *Style: The Basics of Clarity and Grace*. Fifth Edition; Pearson. 2014. ISBN: 978-0321953308

COURSE DESCRIPTION AND OUTCOMES

Writing is a critical part of the scientific research process, not only for the creation of a record of work, or for communicating results in a way that will influence others, but as an integral part of the practice itself.

Scientific writing begins with the description of our vision for a project, often an internal or external funding proposal. It includes the written products created over the lifetime of the project, documentation of methods and data collection, and communication of the project to colleagues, collaborators, and the public. Perhaps most importantly, writing is a key part of problem solving and data analysis. As we document our purpose, process, and findings, we are forced to reflect on the problem from different perspectives. In writing our science, we can actually transform our knowledge of it.

Unfortunately, scientists and engineers often lack strong training as writers. This course 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, engage in peer review, and develop abilities for clear and engaging poster presentations. This course would be a good choice for any student who wants to become a more effective and confident scientific writer, particularly those who are concurrently working on senior theses or capstone projects, considering graduate school, or anticipating technical leadership positions in industry.

This class is designed as an interactive writing workshop that focuses on the *process* of writing. Thus, its success depends on the energy and commitment that each student puts into it. Throughout the term, students will be asked to read and respond to various texts, complete daily writing assignments, respond to other students' writing, and solicit feedback for their own writing. The overall goal is to help students develop the intellectual abilities they need to succeed in an academic environment. This includes honing critical reading and thinking skills; understanding the elements of argument and how to shape a persuasive essay; learning how to find, use, and cite sources; writing effective prose; and revising for clarity.

LEARNING OUTCOMES

Upon completion of this course, students will be able to:

- Approach their scientific writing as "writers," employing rhetorical principles to improve their writing's clarity, concision, and flow.
- 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.
- Critically review 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.
- Develop effective, captivating scientific posters and oral presentations and be able to present and defend them effectively, engaging with the ideas and positions of others productively and actively participating in the collaborative activity of meaning-making.
- Create an e-portfolio of professional writing samples containing the four main products from this course (white paper, research paper, paper for the public, poster), reflections on these works, and the potential to add writing samples from other courses or projects.
- Understand the knowledge-transforming role that writing can play in their lives as scientists or engineers.

CLASS FORMAT, ATTENDANCE AND PARTICIPATION

We will meet twice a week to discuss the principles of scientific writing and our active reading of the assigned material, examine student writing in a workshop setting, experiment with various composition and revision techniques, and discuss the writing process.

This course is based on collaborative discourse so attendance and participation are required. Strong participation includes coming to class prepared, taking part in discussions and exercises, giving your full attention to your peer review partner(s) and the task at hand. X-hours should be left open. I reserve the right to schedule classes then if needed.

Absences for emergency/illness, participation in a college-sanctioned or career development activity, or religious observances will be excused. If you are unable to attend a class meeting due to illness or emergency, please let me know as soon as possible, preferably before class so we don't wait for you. 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. If you have a college-sanctioned or career development activity that will require your absence, please email me beforehand.

A maximum of two unexcused absences will be permitted, with further unexcused absences resulting in a lowered final grade. After two unexcused absences, each unexcused absence will result in a one grade point decrease in the final grade (e.g. A- will become B+).

As a sign of respect for your classmates and the work that we are engaged in together, please turn off your cell phone before entering the classroom and refrain from texting or using your laptop during class (unless it is part of our work).

ASSIGNMENTS

Exercises

Many of our writing exercises will come from *Writing Science* (Schimel). We will discuss the types of scientific journals and articles and the process by which scientists publish their research. We will analyze writing in selected published papers, mostly in class or in small groups. 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. We will also work on short writing exercises related to our own writing. These are intended to help students practice new skills, develop and refine their ideas, and revise and improve the drafts of their major assignments.

Scientific Research Paper
We will discuss 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. Students will write a research paper in their field.

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 in class and outside of class on refining these scientific papers. We will workshop student papers together 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.

White Paper (or Proposal)
A whitepaper is a persuasive, authoritative, in-depth report on a specific topic that describes a problem and provides a solution. White papers are used in business, particularly in consulting and technology firms, and are written by consultants, engineers and/or product managers. In some respects a white paper resembles a proposal, but, stylistically, it strives to be livelier and more engaging than a formal proposal. Unlike a proposal (e.g. NSF or NIH), structure and format are not prescribed. The goal is to communicate your message effectively and concisely to persuade others that your project should be funded. We will examine actual white papers and decide what makes the good ones successful. Style should be professional and written in an active, single voice. Data visualization, schematic, or photographic images may be included.
If you want to write a proposal instead of a white paper, and have a specific Call or RFP to respond to, you may do that instead.

Writing for the Public
It is important for scientists and engineers to convey their work to the general public. We will analyze examples of articles from publications such as Scientific American, National Geographic, New Scientist, Discover, and Technology Review. You will write a short article for a general audience on their own work. You will ask a family member or friend to review it.

Poster
Each student will create a conference quality poster on the scientific research paper that they have written, or on another topic they are studying. We will have a class discussion on what makes an effective poster, focusing specifically on narrative, format, storyline, layout, and graphics. We will develop a grading rubric together and students will grade their peers' posters. We will also discuss the presentation of posters, and students will present their posters to the class.

e-Portfolio
Each student will create a personal e-portfolio of professional writing samples. The e-portfolio will be based on a Wordpress template, personalized to reflect each student's field of interest, and include a short professional biography. It will contain the four main products from this course (white paper, research paper, paper for the public, poster) as well as reflective essays on the pieces. This journaling will help students document their writing development and reflect on their writing process. Each student will write a minimum of three well thought out entries per week. For some I will provide a prompt. On other days, you can choose the subject, perhaps responding to something you see on a general list of questions I will provide that are intended to help you reflect upon your writing method, the role of your writing in knowledge development, or things

you have learned.

Prompts for the journaling will be found under the "Assignments" link on Canvas. I will review and comment on entries approximately weekly. Grading for the e-portfolio setup and the journal entries will be in the form of a simple "check," "check-plus," "check-minus," plus written comments. A "check" signifies a good, solid job of completing the assignment. A "check-plus" will be given for a writing assignment that goes beyond the ordinary in some way. A "check-minus" will be given for hurried, sloppy, or superficial writing that suggests less-than-careful work.

DEADLINES

All assignments are due by 10:00 AM on the day of class regardless of whether you will be in class on the due date. Late assignments will be accepted ONLY in the case of illness/emergency. In all other cases, I will deduct one-third of a letter grade for every day an assignment is late. Assignments more than a week late will not be accepted and you will receive zero credit.

GRADING

Your final grade will be based on:
Article on your research for a scientific audience (including abstract and first draft) – 30%
White Paper – 15%
Short Article for the Public – 15%
Poster (including presentation) – 15%
ePortfolio (including Reflective Writing) – 15%
Participation (Discussions, Peer Review, Exercises, etc.) – 10%

CONFERENCES

In addition to our work in class, I will meet individually with each student during the term to discuss their current work-in-progress. Conferences last 15-20 minutes. To make the most of our time together, please come to conferences on time with your latest revision, ready to talk about your ideas or problems. Make the most of this time—it's your chance to have a willing reader help you think about and improve your writing.

WRITING RESOURCES: THE RESEARCH CENTER FOR WRITING AND INFORMATION TECHNOLOGY (RWIT)

The Student Center for Research, Writing, and Information Technology (RWiT) is a place where you can meet with an undergraduate tutor to discuss a paper, research project, or multi-media assignment. The RWiT tutors are trained to help you at any phase of your process. Whether you are brainstorming or planning, drafting or structuring, tweaking or polishing, the RWiT tutors can provide feedback that will help you improve your papers and projects. Take advantage of this resource! http://dartmouth.edu/writing-speech/learning/support-writing-research-and-composing-technology/rwit

LEARNING DIFFERENCES

If you have a specific challenge with reading, writing, or any other aspect of academic work, please let me know at the beginning of the term. You can also consult with the Academic Skills Center (http://www.dartmouth.edu/~acskills).

MENTAL HEALTH

The academic environment at Dartmouth is challenging, our terms are intensive, and classes are not the only demanding part of your life. There are a number of resources available to you on campus to support your wellness, including your undergraduate dean

(http://www.dartmouth.edu/~upperde/), Counseling and Human Development (http://www.dartmouth.edu/~chd/), and the Student Wellness Center (http://www.dartmouth.edu/~healthed/).

STUDENT NEEDS

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 (Carson Hall, Suite 125, 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 INTEGRITY

Please familiarize yourself with Dartmouth's Academic Honor Principle https://students.dartmouth.edu/judicial-affairs/policy/academic-honor-principle.

All work for this course must be your own original work and written exclusively for this class. If it contains another person's ideas or words, these must be cited properly. If you plagiarize, you will fail the course and be reported through the appropriate channels. Please review *Sources and Citations* (http://dartmouth.edu/writing-speech/learning/materials/sources-and-citations-dartmouth) and the Dartmouth Honor Principle. If you have any questions, talk to me *before* you turn in your draft or essay.

COURSE SCHEDULE: READING, WRITING, AND REVISION
(Subject to change)

Week	Day	Discussion Topic	Homework due next class
1	**1** **Tu 3/26**	Introductions; explaining our field exercise	Read Threads Intro; Schimel Ch. 1&2; Reflection (in notebook)
	2 **Th 3/28**	Discuss Intro to *Threads* Discuss Watson & Crick (1953) From Data to a Story, narrative in science writing Workshop research descriptions	Read Schimel Ch. 3; Exercises 2.1 and 3.1 for Ma et al., 2019; Portfolio set up steps "My Research"
2	**3** **Tu 4/2**	RWIT Portfolio Presentation Making a Story Sticky; Introduction to White Papers/Sample White Papers; propose White Paper/Proposal topics	Read Threads First Section; Read Schimel Ch. 4 and 5; White paper/proposal subject and Opening
	4 **Th 4/4**	Story Structure; Go over White Paper/Proposal plans	Read Schimel Ch. 6 and 7; Read van Allen, McIlwain & Ludwig 1959; White Paper Draft 1
3	**5** **Tu 4/9**	The Opening… discuss van Allen, McIlwain & Ludwig 1959 Peer review openings in our White Paper/Proposals	White paper revisions (Draft 2) Read Threads
	6 **Th 4/11**	Introductions: From Opening to Challenge; Peer review White Paper Draft 2	Read Threads Ch. 2; Read Schimel Ch. 8; White paper revisions (Draft 3) Reflection
4	**7** **Tu 4/16**	Action! (Methods and Results); Executive Summaries and Abstracts	Read Husain (2019); The Blind Spot (Frank, Gleiser, Thompson, 2018)
	8 **Th 4/18**	Peer review Executive Summaries and Abstracts Discuss the Cosmological Constant (Husain, 2019) and The Blind Spot	Final White Paper/Proposal due Mon.; Finish Threads Section 3; Finish Husain (2019); The Blind Spot (Frank, Gleiser, Thompson, 2018); Research ICE Workshop participants
5	**Mon 4/22**	Note: Please set aside time Monday 2:30-6:30 PM to take part in the ICE Workshop	Prepare questions for Dr. Husain
	9 **Tu 4/23**	ICE Workshop; Dr. Husain visit;	Reflection on ICE; Read Schimel Ch. 9 - 12; Reflection
	10 **Th 4/25**	Graphical representation	Read Schimel Ch. 13; Research Paper Outline and Introduction; think about graphics

6	**11** **Tu 4/30**	Peer review Research Paper Outlines and Introductions	Research paper Methods and Results;
	12 **Th 5/2**	Peer review Research Paper Methods	Read Schimel Ch. 15-16
7	**13** **Tu 5/7**	What makes a successful poster?	Read Schimel Ch. 20; Research Paper conclusions; Reflection
	14 **Th 5/9**	Peer review Research Paper discussion and conclusions; Scientific vs. science writing; Planning Short Articles for the Public	Complete Research Paper (due 5/14); Work on your article for the public; Reflection on our audience (the public)
8	**15** **Tu 5/14**	Peer review Research Paper discussion and conclusions	Lay out your poster
	16 **Th 5/16**	Poster workshop; An article for the public peer review	Get someone not in STEM to review your paper for the public; Create a 100-200 word version of your paper for the public; Work on your poster
9	**17** **Tu 5/21**	Discuss our publics' reactions to and our plans for articles for the Public; create an abbreviated two page magazine format "In Briefs" with each student's public paper short version and graphics	Revise longer articles for the public (due 5/28)
	18 **Th 5/23**	Poster presentation guidelines; peer review posters and research papers	Complete and print posters
10	**19** **Tu 5/28**	Poster symposium. Present posters	