

Writing for the Biological Sciences (GR6300)

Weds, 4:10-5:25, 1000 Fairchild

Meehan Crist

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Classes will be held in person unless otherwise indicated.

If we need to meet virtually, you are expected to join the Zoom meeting on a computer so we can work with shared materials. If you anticipate issues connecting via computer, please let me know in advance.

Please be prepared to join the class with your camera on. If you anticipate issues with having your camera on, please let me know.

If you have any questions or concerns regarding accessibility, please let me know.

Shared Google folder link:

https://drive.google.com/drive/folders/1CB_m0mb95hGGOe5zSs3Y6y-Ne89YojJL?usp=share_link
Links to an external site.

INTRODUCTION

Throughout their careers, scientists are expected to communicate their ideas and report their results in writing to the scientific community. Researchers who can make themselves understood tend to get funded, get published, and have more successful scientific careers. But not all researchers learn how to write well—promising science goes unfunded because researchers cannot articulate their ideas; papers are rejected because exasperated reviewers don't want to cull through poorly-written manuscripts for meaning. PhD researchers who decide to go into fields outside academic research often find scientific communication skills among the most sought after in industry, foundation work, and other areas. In short, if you learn to write better, you will be more successful in the sciences. Writing in clear, succinct prose is one of the most important skills you can learn.

Good scientific writing, while it comes in many shapes and sizes, meets objective standards of clarity and quality. In this course, we will explore the choices a writer can make to achieve clarity of thought and clear prose style while communicating complex scientific ideas to other scientists. To that end, we will read examples of scientific writing

from the recent literature, consider the strategies used by successful writers, and workshop student writing.

All the writing you do in this course will be geared toward producing your written Qualifying Exam (see guidelines below). You are required to turn in this document and meet with your thesis committee by June 30 of the summer of your second year. By the end of this course, you will have a complete, revised draft of your written Qualifying Exam.

Reading, Writing, and Workshopping

You will be asked to consider the following: that reading and writing are related and mutually reinforcing activities; that clear writing is a sign of clear thinking; that writing requires understanding your audience; that writing is a process and requires choices; and that the writer is conscious of and responsible for their choices.

You will do in-class writing exercises and write multiple drafts of each section that appears in your Qualifying Exam, including: Introduction, Specific Aims, Approach, Conclusion, and Works Cited. Throughout the semester, you will submit these drafts to the class for critique and discussion. Through the process of revision, you will refine your ideas and practice writing techniques that will help you more effectively communicate your work to other scientists. We will meet for individual conferences during the semester to discuss strategies for improving your work.

In the short term, the workshop process and the writing you produce will be useful as you work on your Qualifying Exams. In the long term, the skills you learn in this course will help you in your STEM career.

Required Texts:

All required readings will be posted as PDFs to Canvas.

COURSE REQUIREMENTS AND POLICIES

Regular Attendance:

Class participation is key to a successful writing workshop. This includes timely submission of assignments and thoughtful participation in class discussions. If you need to miss a class, please let me know in advance, as I may have to adjust the class plan for the day accordingly.

If you know you are going to miss a class due to religious observances, please e-mail me (mc508@columbia.edu) in the first week of classes.

Formatting:

Observe the following protocol with all written work.

- Double-spaced, using a 12-point serif font and one-inch margins
- Name and date on p.1
- Title on p. 1
- Page numbers
- Staple (if hard copy)

Late and Missed Assignments:

All assignments must be turned in on time. Because assignments may be discussed in class, they cannot be made up later. Workshop submissions must be turned in on time to allow your peers sufficient time to read them and respond. If you anticipate a problem with making a deadline, let me know in advance (ideally as soon you know) so that we can work together to best resolve it.

Avoid Plagiarism:

Plagiarism is disrespectful to the work and ideas of other writers and is a serious academic offense. It will be handled in accordance with the official university policy on academic dishonesty; anyone caught committing plagiarism might be expelled from Columbia. Here is a list of some of the forms plagiarism can take from the Columbia University Handbook (140-141).

- Submitting, as one's own, essays (or portions of essays) written by other people;
- Failing to acknowledge, through proper footnotes and bibliographic entries, the sources of ideas essentially not one's own;
- Failing to indicate, through proper use of quotations and footnotes, paraphrases of ideas or verbatim expressions not one's own, including materials on the Web;

- Submitting work written for one course to a second course without having received prior permission from both instructors;
- Collaborating on an assignment or examination without specific permission of the faculty member.

GRADING

As stated above, while good scientific writing comes in many shapes and sizes, it must meet objective standards of clarity and quality. You will be graded on clarity, organization of thought, and coherence. This includes awareness of and engagement with your audience, well-crafted sentences, well-organized paragraphs, attention to the narrative of scientific research, evidence of substantive revision, and overall improvement in your writing. Formatting and proofreading will also be taken into account.

Your writing is worth 80% of your final grade. This includes 30% for assignments (including in-class exercises) and 50% for the final draft of your Qualifying Exam.

Class participation is worth 20% of your final grade. This includes: timely submission of assignments, thoughtful participation in class discussions, regular attendance, on-time arrival to class, and thoughtful participation in conferences.

THE WRITING CENTER

Columbia University has an excellent Writing Center, located in 301 Philosophy Hall (<http://www.college.columbia.edu/core/uwp/writing-center>). The consultants here can offer additional writing support. If English is not your first language, I highly recommend that you take your work to the Writing Center. The consultants there can help point out problematic trends in your grammar, usage, etc., while also helping you to improve a particular piece of writing.

TENTATIVE CLASS SCHEDULE

Each class session will include a discussion of the assigned reading and/or a workshop of student writing. The schedule below is subject to change – for assignments during the semester, refer to the “Assignments” section of our Canvas site.

Week 1, Jan 18: Introduction

Writing Due: Self-Evaluation (in-class writing)

Week 2, Jan 25: The Science of Scientific Writing

Reading Due:

1. Gopen, George W. and Swan, Judith A. "The Science of Scientific Writing." *American Scientist*. 78:550-559, 1990
2. Any papers from your field necessary to complete the writing assignment below. If you're not sure where to start, ask your advisor for a list of 4-6 papers you should read.

Writing Due:

1. Write 2-3 pages (double-spaced) briefly explaining an outstanding problem or knowledge gap in your field. Ideally, this will be a problem that you hope to address with your thesis project. Include a brief discussion of any recent findings you think will be relevant to your proposed research. Imagine an audience of scientists who are not specialists in your particular field. If you're not sure what your thesis project will be, write about an interesting problem currently being addressed by work in your lab. Use citations and include a bibliography of at least 5 papers.
2. Compile a bibliography of at least 10 papers in your field that are relevant to your thesis research and/or relevant to research currently being conducted in your lab. This assignment is meant to help you start thinking about what papers you need to read and potentially cite for your qualifying exam. Use the bibliographic formatting described in the Biology department's "Guidelines For The Written Research Proposal," handed out in class and posted to Canvas.

Week 3, Feb 1: The NIH Research Proposal

Reading Due:

1. NIH and Biology Qual exam Models, TBD

Writing Due:

There is no writing due this week, but in class you will begin drafting specific aims, which means you need to have a set of experiments in mind, which means you need to have a

sense of what your thesis project might be. If you have not already, schedule a meeting with your PI to discuss a plan for your thesis research.

Week 4, Feb 8: Specific Aims

Reading Due:

1. Harmon, Joseph E. and Gross, Alan G. *The Craft of Scientific Research*, "Introducing your problem," pp. 3-18

Writing Due:

What hypothesis do you plan to test? What tool do you intend to build? Draft 2-3 specific aims of no more than 4-6 sentences each that operationalize your project into discrete steps. This should be no more than 1 page total. No citations/bibliography necessary.

Week 5, Feb 15: Specific Aims Workshop

Reading Due: No reading due

Writing Due:

Using the NIH examples as models, write a draft of your 2-page (double-spaced) Specific Aims. Include an "introduction" that articulates your Research Territory, Problem, and Solution as described by Harmon and Gross, as well as 2-3 revised specific aims. Each specific aim should include the four elements we have discussed in class: a) motivation/context, b) what you will do, c) how you will do it, and d) what the aim will provide. If you choose to use citations include a bibliography on a 3rd page. Do not use figures.

Week 6, Feb 22: NO CLASS

Week 7, March 1: Research Strategy - Significance & Innovation

Reading Due: No reading due

Writing Due:

Write the first draft of your "Significance" and "Innovation" sections, which will be included in "Research Strategy." The final length of these section will depend on how you choose to structure your written Qual (where you put preliminary studies, etc.), but

I'd suggest you aim for 2-5 (double-spaced) pages for this assignment. Consider workshop feedback and any changes you want to make to your proposed research plan.

Week 8, March 8: Research Strategy - Significance & Innovation 2

Reading Due:

1. Harmon, Joseph E. and Gross, Alan G. *The Craft of Scientific Research*, "Framing Your Methods," pp. 7-76

Writing Due: None

Week 9, March 15: Research Strategy – Approach

Reading Due: none

Writing Due:

Write the first draft of your "Approach" section, to be included in "Research Strategy." This is where you explain the logic and methods of each Aim in more detail. The final length of this section will depend on how you choose to structure your written qual, but I'd suggest you aim for 4-5 (double-spaced) pages for this assignment.

Week 10, March 22: Revision Strategies

Reading Due: No reading due

Writing Due:

Only Shaoxun, Eric, and Grace: Full Draft of your Qual for Individual Conferences

Week 11, March 29: Workshop 1 - Early Birds (Shaoxun, Eric, and Grace)

OUR SPRING BREAK

Week 12, April 5: NO CLASS

Week 13, April 12: NO CLASS, DRAFT DUE

Writing Due: Full Draft of your Qual for Individual Conferences (Except Shaoxun, Eric, and Grace)

Sign up for a conference time

here: https://docs.google.com/spreadsheets/d/1bCsVcJAb8MZ42N8QioBOTSY_8q1d0BkZtC5m-d7yWIE/edit?usp=sharingLinks to an external site.

Week 14, April 19: INDIVIDUAL CONFERENCES THIS WEEK (NO CLASS)

Week 15, April 26: Workshop 2 - One Full Qual in Small Groups

Reading Due: No reading Due

Writing Due:

Full Revised draft of your Qual for Workshop. Submit a complete draft of your written qual, with Specific Aims and Research Strategy sections, including "Significance," "Innovation," and "Approach", as well as a one-paragraph conclusion. Include citations and a bibliography. Figures are encouraged but not required. This document should be no more than 12 pages of text (not including images and bibliography).

Week 16, May 3: Workshop 3 - All Remaining Quals in Small Groups

Reading Due: 3 Qual drafts for workshop

Writing Due: Peer Review Comments

FINAL PAPERS DUE: DATE TBD

(Depends on the date final grades are due, but likely Weds, May 10)

WORKSHOP GROUPS

Workshop 1, March 29

Workshop 2, April 26

Workshop 3, May 3

WG 1: Shaoxun, Guanqi, Lizzie, Tony

WG 2: Grace, Demi, Tristian, Quilin, Lina

WG 3: Eric, Claire, Hina, Patrick

WG 4: Britt, Riley, Vanesa, Gianluca

WG 5: Nicholas, Vicky, Pedro, Akanksha

WG 6: Lillian, Thomas, Lena, Ray

QUALIFYING EXAMINATIONS

Source: Graduate Student Handbook

<https://www.biology.columbia.edu/programs/graduate-student-handbook#Qualifying%20Examinations>

The deadline for the Q.E. is June 30th of the second year.

Students will prepare a written proposal based on their intended research project, as perceived at that time. The proposal will be in the form of a short fellowship application (see guidelines below), and is honed during the Tier 1 BIOL GR6300 spring writing course. Students will submit this proposal to qualifying exam committee consisting of two faculty members from the Biological Sciences graduate program, not including the student's faculty sponsor, then present and defend the proposal before this committee.

The deadline for proposal defense is June 30th of the student's second year. The written proposal should be submitted to the committee at least two weeks before the oral defense of the proposal. For the oral defense, the student should prepare a Powerpoint presentation, approximately 30 minutes long and be prepared for questions to be asked throughout the talk.

The committee will probe the student's general knowledge in the area represented by the project, the area represented by the sponsor's laboratory, and the areas covered in courses the student has taken. Students should be prepared to describe any procedure proposed in the research plan. Although the structure of the oral examination will be that of a defense of the proposal, the emphasis will be as much on general knowledge in these areas as on the merits of the specific research proposed. The examining committee will be made up of two faculty members from the program's training faculty.

The official policy is that the student's research sponsor is excluded from the exam; however, if the other members of the committee agree, the advisor may attend the exam as an observer.

Students whose performance is judged unsatisfactory on this exam will be given one additional opportunity to take the exam no later than the end of the Spring semester of the third year. The committee for the second exam shall be comprised of the original members plus the sponsor. The student also has the prerogative to request a new committee for the second exam comprised of two new faculty members plus the sponsor.

IMPORTANT: Be sure to print the [Qualifying Exam](#) form and take it with you to your Qualifying Exam for your committee to sign. Then return the form to 600 Office.

Guidelines for the Written Research Proposal

These guidelines are discussed in depth in course BIOL GR6300 Writing for the Biological Sciences. The format is similar to an NIH predoctoral research fellowship, except that the space limitations have been changed for double-spaced formatting and up to 7 figures may be included outside of the page limits. References are not included in the page limits.

1. Specific Aims

- Specific Aims are limited to two double-spaced pages. State concisely the goals of the proposed research and summarize the expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved. List succinctly the specific objectives of the research proposed, e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology.
- Research Strategy
- This item is limited to twelve double-spaced pages. Organize the Research Strategy in the specified order using the instructions provided below. Start each section with the appropriate section heading —Significance, Innovation, Approach. Cite published experimental details in the Research Strategy section and provide the full reference in the Bibliography and References Cited section.
 - Explain the importance of the problem or critical barrier to progress in the field that the proposed project addresses.
 - Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.
 - Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

- Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Include how the data will be collected, analyzed, and interpreted.
- Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.
- If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work.
- Significance
- Innovation - Optional.
- Approach

Date	Details	Due
Wed Jan 18, 2023	Assignment Self-Assessment (in-class writing)	due by 11pm
Fri Jan 27, 2023	Assignment The Science of Scientific Writing	due by 4pm
Wed Feb 1, 2023	Assignment The NIH Research Proposal	due by 4pm
Wed Feb 8, 2023	Assignment Specific Aims	due by 4pm
Wed Feb 15, 2023	Assignment Specific Aims Workshop (Letter Grade)	due by 4pm
Wed Mar 1, 2023	Assignment Research Strategy: Significance & Innovation	due by 4pm
Wed Mar 22, 2023	Assignment Research Strategy: Approach	due by 4pm
Wed Apr 12, 2023	Assignment Full Draft of Qual for Individual Conferences (Letter Grade)	due by 4pm
Wed Apr 26, 2023	Assignment Revised Draft for Workshop: Workshop 1 (3/29), Workshop 2 (4/26), Workshop 3 (5/3)	due by 4:10pm
Wed May 3, 2023	Assignment Workshop 3	due by 4pm
Wed May 10, 2023	Assignment Final Draft, Qual Exam (Letter Grade)	due by 11:59pm

Date	Details	Due
	Assignment Class Participation	
	Assignment Roll Call Attendance	

If an applicant has multiple Specific Aims, then the applicant may address Significance, Innovation and Approach for each Specific Aim individually, or may address Significance, Innovation and Approach for all of the Specific Aims collectively.

For new applications, include information on preliminary studies, if any. Discuss the applicant's preliminary studies, data and/or experience pertinent to this application. When applicable, provide a succinct account of published and unpublished results, indicating progress toward their achievement. [This should be done within the Research Strategies section, usually in Significance.]

Provide a bibliography of any references cited in the Project Narrative. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. Include only bibliographic citations. Applicants should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the application.

The proposal should be formatted according to the following guidelines:

- Double-space all text, except captions for figures, which may be single-spaced.
- Use an 11 or 12 pt. font such as Arial, Helvetica, Palatino Linotype, or Georgia.
- Use 1-inch margins on top, bottom, left and right.

Course Summary: