

# Math That Lies: Communicating Why Some Quantitative Arguments Are Misleading or Bogus — Math 380A and Honors 221B

Calderwood Seminar in Public Writing

Instructor: Neal Koblitz, Professor of Mathematics, koblitz@uw.edu

Class meets in Sieg 229 on Thursdays 8:30–11:20

“There are three kinds of lies: lies, damned lies, and statistics.”

–Often attributed (falsely) to 19th century British Prime Minister Benjamin Disraeli

“Las matemáticas no mienten, pero los mentirosos usan las matemáticas.”

(Math doesn’t lie, but liars use math.)

–Uldarico Malaspina, Professor of Mathematics at the Pontificia Universidad Católica del Perú

When encountering arguments using numbers or equations, even well-educated people are often paralyzed — like deer in the headlights — and lose their capacity for critical thinking. For decades, some public writers have been trying to change this — Darrell Huff, John Allen Paulos, Stephen Jay Gould, and more recently Cathy O’Neil, Adam Kucharski, and (here at UW) Carl Bergstrom. The purpose of this course is to help you develop the skills needed to join their ranks and write clearly and perceptively about quantitative arguments.

Calderwood Seminars are part of a system of courses designed to promote excellence in public writing by undergraduates. It started at Wellesley in 2013, and has gradually spread to over a dozen other universities, including UW starting in 2019. The course requires commitment, curiosity, and a critical mindset.

## LEARNING GOALS

- To increase your skill and confidence as writers.
- To learn how to collaborate effectively as editors and workshop participants.
- To learn how to process, analyze, and criticize mathematical arguments related to socially important controversies.
- To learn how to communicate in clear, crisp, lively, and error-free prose about the challenges and pitfalls in interpreting quantitative information.

The key to improving your writing during this course will be to participate fully and thoughtfully in the writer-editor relationship and in the workshoping on Thursdays. In that way you will develop your skill at giving and taking constructive feedback.

## READINGS

The course material consists of various articles that I'll upload to Canvas and four books. The books are:

- *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy* by mathematician Cathy O'Neil (paperback is currently available on Amazon for  $\approx$  \$13).
- *The Mismeasure of Man* by paleontologist and science popularizer Stephen Jay Gould (expanded 2nd edition, currently available on Amazon for  $\approx$  \$16).
- *Math on Trial: How Numbers Get Used and Abused in the Courtroom* by Leila Schneps and Coralie Colmez, a mother-and-daughter team of mathematicians (currently available on Amazon for  $\approx$  \$20).
- *A Writer's Reference* by Diana Hacker and Nancy Sommers (it's okay to get a used spiral-bound 7th or 8th edition, which should be available on Amazon for under \$20; I have two extra copies I can lend for the quarter if you can't find a copy at an acceptable price).

If you want to use kindle or library copies, that's okay. But you'll need to have each of the first three books for a few weeks in order to read it, then either edit another student's review or write your review and then the final version after the workshopping in class.

## OVERVIEW OF CLASSES AND ASSIGNMENTS

The class will be divided into Group A and Group B. Each week one group will be writers and the other will be editors, and this will alternate. Since half of the class is enrolled through Honors 221B and half through Math 380A, for convenience let's have the Honors 221B students be Group A and the Math 380A students be Group B. We now have 6 in each group. If, say, group A is the group of writers, then, starting with the second written assignment, editors and writers will further be divided as follows:

A1 — You will be paired with an editor from B1, and your written work will also be workshopped in class.

A2 — You will be given two editors from B2 and B3, and your written work will not be workshopped (but feel free to email me with any questions about revision).

A3 — You will not have a student editor or workshopping; instead, I will give you detailed corrections and feedback.

B1 — You will be paired with one editor from A1, to whom you'll give detailed corrections and feedback in time for them to do their first revision and send it to me no later than Tuesday night for Thursday's workshopping.

B2 and B3 — A student from each group will meet with and give corrections and feedback to one of the A2 writers.

With an enrollment of 12 we'll have four students in A1 and in B1, one in A2 and in B2, and one in A3 and in B3. We will rotate these groups so that, with rare exceptions, everyone is in groups A2, A3, or B2/B3 at most once.

**Early in Week 1** (preparing for the first class meeting on Thursday): The following short readings are posted in the “Files” section of the course’s Canvas page. Please read them and be ready to discuss them in class: (1) “Mathematics As Propaganda” (10 pages), and (2) a chapter from *How To Lie with Statistics* (pp. 76-88). In addition, please read pages 3-8 of the writing exercises posted on Canvas and see if you can fix the writing problems in the exercises. Please pick out between 5 and 10 of them that you have trouble with (either you don’t see what’s wrong or don’t see how to fix it) and which it would be useful to discuss in class. The posted writing exercises are 14 pages long, but I’m asking you only to read pp. 3-8 carefully. Our discussion of grammar and style problems will start with the examples of poor writing on pp. 1-2, which are taken from *The New York Times* and from an official UW website. The examples on pp. 9-14 will be discussed in a later class. I will also send the class an email with the two readings and the writing exercises in attachments, in case you don’t yet have access to Canvas.

**Week 1 class** (Jan 4): Introduction to the topic of misuses of mathematics and quantitative reasoning, discussion of “Mathematics As Propaganda” and the chapter of *How to Lie with Statistics*, and in-class editing of some of the examples on pp. 1–8 of the posted writing exercises. The first meeting will also cover the goals and organizational details of the course. Finally, we’ll discuss the first written assignment, which will be workshopped in Week 2 (for Group A) and Week 3 (for Group B), and go over the due dates for the stages of editing and writing.

**Week 2** (class on Jan 11) The first assignment is to write a letter to the editor of *The New York Times* (no more than 175 words, which is the newspaper’s limit) commenting on Shiller’s op-ed (posted in the “Files” section of Canvas). Your letter should clearly explain one or at most two logical flaws or gaps in his argument. Group B editors meet with the writers (recorded on Zoom, at least for the first assignment) to give corrections and feedback, early enough so that the writer can revise and send the revision to me in advance of the Jan 11 class. Final versions of the letters are due on Jan 18. In addition, during the week you should read most of the assigned pages of *Math on Trial* (you may skip Chapter 4) so that you’ll have a chance to ask any questions about it during class on Jan 18 before writing your review or editing a classmate’s review. In general, it’s a good idea to start reading each of the three books at least two weeks before the workshopping of the book reviews.

I’ll give a brief introduction to the next article for you to read, including an explanation of what CDS (credit default swap) and CDO (collateralized debt obligation) are all about. We’ll also have a visit for about an hour from math professor Stefan Steinerberger, who will speak about his personal experiences when dealing with fallacious quantitative arguments in economics and getting into heated exchanges in journals.

**Week 3** (class on Jan 18): Group B writes a brief article of 200-300 words summarizing (in plain English) the main points of the article “The Formula That Killed Wall Street.” After editing, workshopping, and revisions, the final versions will be due on Jan 25. We’ll also discuss guidelines for the third writing assignment, in which group A writes a roughly 750-word book review of *Math on Trial* (common text) and group B edits.

**Week 4** (class on Jan 25): Workshopping the Group A book reviews (the final version is due on Feb 1) and discussion of guidelines for the fourth writing assignment. In that

assignment each student in Group B writes a 750-word article as might appear in the science section of a newspaper, in which three articles on the UW IHME model of the Covid-19 pandemic (common text) are discussed. Two of the articles you will read (by Sharon Begley of *statnews.com* and by Kelsey Piper of *Future Perfect*) are highly critical and the other one (by IHME director Christopher Murray) defends the IHME approach. This is also a good time to start reading *Weapons of Math Destruction*. You are not required to read the whole book, but please read Chapters 1, 2, 3, 5, and 8 carefully.

**Week 5** (class on Feb 1): Workshopping the Group B science articles on the IHME Covid-19 model (the final version is due on Feb 8) and discussion of guidelines for the fifth writing assignment, in which each Group A student writes a 750-word blog post reviewing the book *Weapons of Math Destruction* (common text) and group B edits. This is a good time to start reading the third book, *The Mismeasure of Man*.

Concerning the book *The Mismeasure of Man*: You are not required to read the whole book, which is over 400 pages. Please read Chapters 5–7, taking notes and jotting down comments and questions. Your book review must devote some space to explaining — briefly, but in a way that your readers will understand — Gould’s central mathematical point concerning the “factor analysis” fallacy that he calls “reification.”

Although there are more recent books on the topic of racist pseudoscience (for example, *Superior: The Return of Race Science* by Angela Saini, and *Race, Racism, and Science* by John P. Jackson, Jr. and Nadine M. Weidman), none of them explains the ways that mathematics is misused. For a relatively quick overview of the general topic, you might want to read the Wikipedia article “Race and Intelligence.”

**Week 6** (class on Feb 8): Workshopping the Group A book reviews (the final version is due on Feb 15) and discussion of guidelines for the sixth writing assignment, in which Group B students write roughly 750-word book reviews of *The Mismeasure of Man* (common text) and Group A edits.

**Week 7** (class on Feb 15): Workshopping the Group B book reviews (the final version is due on Feb 22) and discussion of guidelines for the seventh writing assignment, in which everyone in Group A writes a script of 250 to 300 words for an NPR Academic Minute about an example of the misuse of math that’s chosen by the writer (common genre, possibly joint byline with about 500 words); Group B edits. Please email me your topic as soon as possible, so that I can either approve it or suggest changes. Also, Group B should start reading their books for the eighth writing assignment, which is to write a 750-word review of a book of the writer’s choice that analyzes some misuses of mathematical/quantitative reasoning (common genre, possibly joint byline with 1000-1200 words). Some possible books: (1) *People Count* by Susan Landau (perhaps focusing on Chapter 5); (2) *Calling Bullshit* by Carl Bergstrom and Jevin West (who are UW professors) – see especially Chapters 4, 5, 7, and 11; (3) *The Rules of Contagion* by Adam Kucharski (perhaps focusing on the author’s carrying over disease epidemiology to non-medical settings). Please email me your book title for approval before starting work on it.

**Week 8** (class on Feb 22): Workshopping the Group A NPR scripts (the final version is due on Feb 29).

**Week 9** (class on Feb 29): Workshopping the Group B book reviews (the final version is due on March 7).

**Week 10** (class on March 7): Concluding discussion of the social damage caused by pseudo-mathematics. Group B's final versions of the common genre book reviews are due on March 7, and Student Reflections on the Course are due (as an email attachment) by 6 pm on Friday March 8.

## WEEKLY RHYTHM OF THE CLASS

Each week one half of the seminar participants (say, Group A) will write on the assigned topic. The other half (Group B) will serve as editors and commentators on these essays. In order for the seminar to function smoothly, **all participants need to adhere to the schedule** and complete their roles in a timely fashion. Each A1/B1 essay will go through three stages of revision, using Zoom (or in-person meetings) and shared .docx files or Google Docs. Writers in A2 and A3 and editors in B2 will have a more relaxed schedule, since the writer doesn't need to have revisions sent to me in time for in-class workshopping.

STAGE 1. Writers share a draft with their assigned editor(s) by a mutually agreed-upon time on Sunday evening (preferred) or Monday (at the latest). The editor meets with the writer (perhaps on Zoom) to share their comments and suggestions. That meeting should occur no later than Tuesday morning. The first two times (in Weeks 2 and 3) please record on Zoom if possible, and share it with me (koblitz@uw.edu) and with the writer. I'll want to briefly check that the editors are properly fulfilling their role, and the writer may want to have the recording to refer back to during revision. You might also record later editor-writer meetings on Zoom for the writer (but not to send to me).

STAGE 2. A1 writers produce revised drafts and send them to me (koblitz@uw.edu) no later than Tuesday night so that I can share them with the whole class. All participants in the seminar must have read and thought about these revised drafts and (in the case of common text assignments) also finished reading the common text **before** class discussion on Thursday morning. Please have notes with comments on the revised draft so that you're prepared to discuss the drafts. The seminar will workshop the drafts during class.

Workshopping the assignments will take roughly 2/3 of the Thursday class. Some time will be devoted to previewing the topic for the following week. We'll also discuss writing exercises based on sections in *A Writer's Reference* that deal with common problems that bring down the quality of public writing (wordiness, poor word choice or word usage, run-on sentences, jargon, clichés, lack of parallelism, dangling modifiers, unclear antecedents, wrong tense, awkward passive constructions, punctuation errors, and so on).

STAGE 3. Final versions of the essays are due in class the following Thursday. I will assign a grade to the final version.

Please feel free to email me with any questions that you have during the quarter. If you want to talk about something instead of emailing, we can set up a private Zoom meeting.

## USE OF WIKIPEDIA

Wikipedia articles are useful for two purposes: to get an overview of a topic, and to get a start on finding suitable sources. Most Wikipedia articles have extensive footnotes and often sources for further reading.

Wikipedia is not perfect. It has been criticized for poor writing, uneven application of editorial policies, inadequate coverage of prominent women and people of color, U.S.-centric bias, and many other things. Wikipedia even has an article on “Criticisms of Wikipedia.” As a general rule, articles on major topics tend to be better written and more reliable than articles on side topics. For example, the article “Scientific racism” is in pretty good shape, whereas the somewhat related article “John Hunter (surgeon)” is less so. The reason is that articles on major topics are watchlisted — that is, monitored — by many editors, who tend to spot deficiencies and fix them.

## USE OF AI BOTS

Please do not use AI bots in this course, for two reasons. First, according to University plagiarism policy, the papers you hand in should be fundamentally your own work. Just as it would be wrong to have someone else write the draft of a paper that you will hand in, the same applies to a draft written by AI software. The second reason is that essays written by AI bots are compiled from what the algorithm finds on the Internet. They are superficial, are often full of inaccuracies or outright falsehoods, and of course never use independent thinking and analysis. Independent thinking and analysis are at the heart of this course.

Further information:

The University’s policies concerning Covid-19: <https://www.washington.edu/coronavirus/>

The University’s religious accommodations policy:

<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>