

Syllabus

Biol/Math/Psych/Stor 115 – Fall 2020 **University of North Carolina at Chapel Hill** **Instructor: Todd Vision**

Overview

What fraction of the population needs to be vaccinated to prevent or stop a disease outbreak? How do you predict the financial consequences of taking a job when you graduate versus getting a higher degree? How do you judge whether an election map is gerrymandered? Students will address questions like these as they apply mathematical and statistical methods to address societal problems, make personal choices, and reason critically about the world.

The course has three target audiences:

- students from nonscience majors who wish to satisfy the Quantitative Reasoning focus of the General Education curriculum;
- students who wish to have additional preparation before taking the quantitative courses required of science majors; and
- students interested in learning how to apply quantitative reasoning to their world.

The class has no prerequisites. It counts for 3 credit hours.

Course goals and learning objectives

Students will learn to apply mathematical concepts in authentic contexts, developing tools for reasoning with data, logic, and quantitative methods.

Some of the kinds of questions we will address are:

- What is the role of mathematics in organizing and interpreting measurements of our world?
- How can mathematical models and quantitative analysis be used to summarize or synthesize data into knowledge and predictions?
- What methodology can we apply to validate or reject mathematical models or to express our degree of confidence in them?

Student Learning Outcomes:

- Summarize, interpret, and present quantitative data in mathematical forms, such as graphs, diagrams, tables, or mathematical text.
- Develop or compute representations of data using mathematical forms or equations and models and use statistical methods to assess their validity.

- Make and evaluate important assumptions in the estimation, modeling, and analysis of data, and recognize the limitations of the results.
- Apply mathematical concepts, data, procedures, and solutions to make judgments and draw conclusions.
- Synthesize and present quantitative data to others to explain findings or to provide quantitative evidence in support of a position.

Instructors

Instructor: Todd Vision ("Dr. V"), Associate Professor of Biology, tjv@unc.edu

Teaching Assistant: Kuangyi Xu, Biology PhD candidate, kxu@email.unc.edu

Office hours will be arranged by means of a poll of students at the beginning of the semester.

Class times and meeting info:

Classes are synchronous.

Meeting times: Monday, Wednesday, & Friday, from 10:40am-11:30am

Location: Cyberspace! <https://unc.zoom.us/j/xxxxxxxxxxx> (Accessible only to UNC zoom users. For alternate ways to connect to zoom meetings, see the Sakai Lessons page).

Course tools:

Sakai: Course materials will generally be hosted by or linked from Sakai (as you probably have figured out since you are here already). Everything you need to do for each class will be organized chronologically under Sakai->Lessons.

Gradescope: You will use Gradescope for turning in homework and taking the quizzes and tests. You can check that you are registered by logging in with your UNC address at <http://gradescope.com>. If you still need to register, use Entry code 963YGB.

Piazza: We will use Piazza as our forum for me to make announcements, for you to ask questions and get answers about assignments, course logistics; and generally to communicate with the class. Note that you can set your posts to be anonymous to other students, but not the instructors. And please use email to contact the instructor or TA if you have a private concern. If you were not already automatically added to Piazza, you can register yourself at <https://piazza.com/unc/fall2020/xxxxx>. If you have any problems or feedback for the developers, email team@piazza.com.

Poll Everywhere: We will use PollEverywhere (PollEv for short) throughout the class, especially during class. You can use PollEverywhere on either your phone or laptop

(phone is generally more popular). If you were not registered automatically, you can register at <http://poll.unc.edu>. You will need to be logged in to your official Poll Everywhere student account before you can respond to polls. My polls will be at <http://www.pollev.com/xxxxx>. Technical help is also available at <http://poll.unc.edu>.

New York Times: Students should sign up for free, unlimited, access to the New York Times, since we will be assigning readings from it throughout the semester: http://nytimesaccess.com/unc-chapel_hill/. More information at <https://guides.lib.unc.edu/nyt-academic-pass>.

Other tools: We will also be using Google Spreadsheets and R statistical software to analyze data. No prior experience with any technology is expected, One goal of this class is to introduce students to the tools used by data analysis professionals at a level that they can easily absorb and incorporate into their own lives.

Where to get help

- See office hours above, updates will be made via Piazza. Email for special appointments.
- The Learning Center has a math coach who can give tips on how to study for and succeed in math classes: <https://learningcenter.unc.edu/services/academic-coaching/>
- The Math Help Center offers free drop in tutoring nearly every day (see website for schedule), and also can connect you with paid tutors. Tutors are not guaranteed to be able to help with classes outside the standard precalculus / calculus curriculum, they may be able to. <http://math.unc.edu/undergraduate/math-help-center/>
- UNC-Chapel Hill facilitates the implementation of reasonable accommodations for students with learning disabilities, physical disabilities, mental health struggles, chronic medical conditions, temporary disability, or pregnancy complications, all of which can impair student success. For contact and registration information: If you require a recurring accommodation: [Accessibility Resources and Services](#).
- For other issues that transcend your participation in this class, you can generally get help from your Academic Advisor, the office of the [Dean of Students](#), or one of the support services listed [here](#). This includes [Counseling and Psychological Services \(CAPS\)](#), which address the mental health needs of students through consultations and connection to clinical professionals, both for short or long-term needs.
- In the event of an unanticipated or extended absence, please let the TA and/or instructor at the earliest opportunity. The Dean of Students is best placed to assist with sudden and/or extended absences due to health or personal/family emergencies.

Homework

Pre-class assignments: Before each class, you will be asked to do a reading and/or watch a video and answer a few questions. Instructions for what to do before class can be found under the class date on this Sakai > Lessons page. Typically, you will answer questions using PollEverywhere or Gradescope.

Post-class homeworks: There will additionally be a homework assignment due every week or two that cover the material from several classes. These homeworks should be submitted via Gradescope. The problems themselves will be posted on Sakai > Lessons under each day's date, and compiled at the end of the week as a single pdf at Sakai > Resources > Homework Problems and Solutions, with a link at the bottom of the Sakai > Lessons page.

Late homework will be accepted with a penalty of 50%. Make-up quizzes will only be given for University Approved Absences. Make-up quizzes should be arranged and completed in advance, except when impossible due to health or emergency situations.

Grading policies

The graded components of the course include the following:

Component	Description	Policies	Points
Participation	See below.	Participation points can be achieved by a variety of means, see below.	20
Homework assignments	Approximately one per week	Lowest score dropped.	20
Quizzes	One per module	Quizzes will be done in two stages. First, students will complete the quiz individually. Second, students will work in small groups to complete a second copy of the same quiz. Scores from the individual and group stages will be averaged. The lowest (averaged) score is	20

Component	Description	Policies	Points
Final projects	Group write-up and video	dropped at the end of the semester.	20
		The final project will culminate in a 5-10 pg written paper and a 5-10 minute presentation video, in lieu of a final exam. Projects will be carried out by small teams of 3-4 students. Teams can choose a project from a list of suggestions or request approval for their own project idea from the instructor. Students will vote on the videos during the final exam period. Students will receive an individual grade for their written report and a group grade for the video presentation.	

Participation points

There are a variety of ways to participate in the class and enrich the class learning environment for yourself and your classmates. Participation points can be captured a variety of ways, recognizing that different students may engage with the class in different ways out of necessity or inclination this semester. Although a maximum of 20 points can be credited to your score, you may earn more points than that just by participating enthusiastically. In fact I hope you do, because it will make the value of the class that much greater for you and your classmates, and no doubt that effort will be reflected in your performance on the other graded work. Points are earned by any combination of the following categories:

- *Breakout group leadership*: By serving as a facilitator or scribe during a breakout session. 1 pt each up to 5 pts.
- *Piazza*: Credit is earned by posting a thoughtful, relevant and specific content-based question or by giving a thorough answer & explanation to another person's as-yet unanswered question. To have your post considered for participation points, be sure to include the hashtag #Participation. 1 pt each up to 5 pts.
- *Poll Everywhere*: Poll questions will accompany each class to check your understanding as you go. These can be completed synchronously, or within an allowed time window after class. You will receive all 10 pts for answering all 100% of the questions, 9 for 90%, and so on down to 1 pt for 10%.

- *Office hours:* Points are awarded for attending office hours with the instructor or TA and having a substantive question to discuss. 1pt for each separate session you attend, up to 5 pts total
- *Study group:* I encourage you to work outside of class with your classmates. 3 pts are awarded for having a study group that meets (outside of class) at least once by the end of September, to encourage you to do that early. Take a zoom screenshot with your profiles visible and send it to the instructor & TA with a list of who attended the study group. There must be at least 3 students in the group to count. You can use the Piazza Search for Teammates tool to find study partners.

Final grades: Cumulative grades will be rounded to one decimal place. Final grades will be assigned according to the following scale. The instructor reserves the right to make adjustments to the scale when final grades are assigned, but in no case will such adjustments *lower* a student's letter grade.

Letter grade	Percentage
A	93-100
A-	90-92.9
B+	87-89.9
B	83-86.9
B-	80-82.9
C+	77-79.9
C	73-76.9
C-	70-72.9
D+	67-69.9
D	60-66.9
F	below 60

Working to ensure an inclusive environment

We affirm our commitment to the following values, and strive to see these realized within our university community:

- Respect for the dignity, essential worth, and human potential of all individuals.
- Respect for the ideas and beliefs of others.
- Respect for the privacy, property, freedom and health of others.
- Rejection of discrimination, violence, or intimidation of any kind.
- Striving for personal and academic integrity.
- Celebrating the diversity of human experience that is the lifeblood of a great university.

Please feel empowered to report to the instructor or TA if you experience or witness anything in this course that does not support an inclusive environment. You can also report any incidents you may witness or experience on campus, or in your remote class, to the Equal Opportunity and Compliance Office at <https://eoc.unc.edu/report-an-incident/>. Additional resources are available through the Office of Diversity and Inclusion at <https://diversity.unc.edu>.

Honor Code

You are bound by the Honor Code in all your course work, and submission of your work assumes understanding and acceptance of its terms. Plagiarism will not be tolerated. Please consult with the instructor if you have any questions. <https://catalog.unc.edu/policies-procedures/honor-code/>

Changes

The instructor reserves the right to change the Syllabus and Schedule as deemed necessary. Changes will be noted here by using green underlined text for new content and ~~red strikethrough~~ for content that has been deleted.

Schedule of topics

August

- M 10 - Introduction to "Reasoning with Data: Navigating a Quantitative World"
- W 12 - The World of Data - Visualizations great and not-so-great
- F 14 - The World of Data - Dynamic visualizations with Gapminder
- M 17 - People's choice - Opinion polling sampling and bias
- W 19 - People's choice - Opinion polling distributions and margins of error
- F 21 - People's choice - Gerrymandering efficiency gap
- M 24 - People's choice - Gerrymandering efficiency gap
- W 26 - People's choice - Gerrymandering efficiency gap & compactness
- F 28 - People's choice - Gerrymandering compactness
- M 31 - People's choice - Gerrymandering compactness

September

- W 2 - People's choice - Gerrymandering - wrap up
- F 4 - Quiz 1
- M 7 Labor Day
- W 9 - Epidemic! - diagnostic testing
- F 11 - Epidemic! - fitting data
- M 14 - Epidemic! - fitting data
- W 16 - Epidemic! - fitting data
- M 21 - Epidemic! - fitting data
- W 23 - Epidemic! - predicting dynamics
- F 25 - Epidemic! - predicting dynamics
- M 28 - Epidemic! - dynamics with vaccination
- W 30 - Epidemic! - Application to SARS-CoV-2

October

- F 2 - Quiz 2
- M 5 - Getting started on projects
- W 7 - Money matters - Insurance
- F 9 - Money matters - Insurance

M 12 - Money matters - Insurance
W 14 - Money matters - Savings and debt
F 16 - Money matters - Savings and debt
M 19 - Money matters - Taxation
W 21 - Money matters - Taxation
F 23 - Quiz 3
M 26 - Project workday
W 28 - Counting communication - Social media
F 30 - Counting communication - Social media

November

M 2 - Counting communication - Social media
W 4 - Counting communication - Social media
F 6 - Quiz 4
M 9 - Project workday
W 11 - Project workday
F 13 - Project workday
M 16 - Project workday
? ? - Film Festival (aka Final Project Presentations), to be scheduled by Registrar