UC SANTA BARBARA
Bren School of Environmental Science & Management

EDS 240: Data Visualization and Communication (4 units, Winter 2025)

Course Catalog: *https://bren.ucsb.edu/courses/eds-240*

Prerequisites: *None required for MEDS.* Non-MEDS students must be able to demonstrate proficiency in using the R programming language and working in the RStudio integrated development environment (IDE). Specifically, this course assumes prior experience in using `{tidyverse}` packages / functions for data exploration, cleaning, and wrangling. Additionally, students must have familiarity with using git and GitHub for version control. Experience writing code in `.qmd` (Quarto Markdown) and / or `.rmd` (R Markdown) files is helpful, but not required. Non-MEDS students may be asked to provide a link to a GitHub repository containing code written in R to demonstrate these prerequisite skills. Certain courses (e.g. ESM 244, ESM 232) may fill these prerequisite requirements -- please contact the course instructor to discuss your eligibility.

Meeting Time & Location

Class (Bren 1424)	Discussion Section (Bren 3022A, SCF)
Mondays 12:15-3:15 pm PT	**Tuesdays** 1:00-1:50 pm PT (section D1) 2:00-2:50 pm PT (section D2)

Instructor & TA Information

	Sam Shanny-Csik (Instructor)	Annie Adams (25% TA)	Sloane Stephenson (25% TA)
Email	scsik@ucsb.edu	aradams@ucsb.edu	gstephenson@.ucsb.edu
Office	Bren 3512	-	-
Student Hours	Tue. 12:00 - 1:00 pm (Pine Room, 3526)	-	Thu. 12:00 - 1:00 pm (Bonsai, 4327)
Primary responsibilities	Leading lectures, holding student hours, grading all self-reflections (SRs), providing feedback on HW #3, grading HW #4	Leading discussion sections, grading HW #1 (part II), HW #2 (part II), HW #3	Assisting during lectures, holding student hours, grading HW #1 (part I), HW #2 (part I)
***The best way to contact me is**	MEDS Slack **#eds-240-data-viz** channel	MEDS Slack **#eds-240-data-viz** channel	MEDS Slack **#eds-240-data-viz** channel
Learn more about me	https://samanthacsik.github.io/	https://annieradams.github.io/	*NA*

***If you have a question about course-related content, we ask that you reach out about it in #eds-240-data-viz channel, rather than a direct message or email** -- oftentimes there are others who have the same question and will benefit from seeing the discussion! Of course, please direct message or email with any personal questions or concerns.

Course Details

Course Website:

https://eds-240-data-viz.github.io/

All lecture slides, discussion materials, resources, and important information will be posted to this course website.

Course Description & Learning Objectives:

Effectively communicating your work in a responsible, accessible and visually-pleasing way is often (if not, always) a central part of data science. This course will focus on the basic principles for effective communication through data visualization and using technical tools and workflows for creating and sharing data visualizations with diverse audiences.

By the end of this course, learners should be able to:

- Identify which types of visualizations are most appropriate for your data and your audience
- Prepare (e.g. clean, explore, wrangle) data so that it's appropriately formatted for building data visualizations
- Build effective, responsible, accessible, and aesthetically-pleasing visualizations using the R programming language, and specifically {ggplot2} + ggplot2 extension packages
- Write code from scratch *and* read and adapt code written by others
- Apply a DEI (Diversity, Equity & Inclusion) lens to the process of designing data visualizations
- Assess, critique, and provide constructive feedback on data visualizations

Computing requirements:

Reminder: *You can reference the MEDS installation guide if you need to (re)install / (re)configure any software.*

- Minimum MEDS device requirements
- R version 4.4.0 (or higher)
- RStudio version 2023.06.0 (or higher)
- git (configured on your local computer) & GitHub account (connected to your local git)

Recommended materials / resources:

There are no required textbooks or readers for this course. There are, however, tons of great (and free!) online books and resources on data visualization and communication. We'll reference a few select chapters / readings / etc. throughout this course. Find a list of recommended resources, inspirational data viz creators, and more on the course website.

Class structure:

Daily class structure may vary depending on the week / topic, however, you can *generally* expect the following:

- **01:00 pm** Check *learning partner* assignments for the week and find a seat with them
- **01:00 - 03:55 pm** A mix of lecture, live-coding, and interactive group work (with scheduled breaks throughout)
- **3:55 - 4:00 pm** End-of-class survey (if time allows)

Class will consist of a mix of slide-based lectures, live-coding, and individual / group-based critical thinking / theoretical and technical exercises. *Learning partner* assignments will be shared ahead of each class -- please find a seat together when you arrive for class.

What are *learning partners*, how do I get mine, and why are we doing this?

Learning partners are a mix of accountability-buddies, people to help you troubleshoot when you're stuck, and your assigned group mates for any in-class activities. Maybe you

need a second set of eyes to help you spot that misspelled variable name in your code, or you want to compare approaches for solving an in-class problem. Your learning partners should be the first people you turn to.

Learning partner groups (2-3 students each) will be randomly assigned and shared ahead of each class each Monday. Find your learning partners and sit with them for class that week.

Learning partners have a number of benefits! Including:

1. You'll get to know more of your classmates / colleagues better
2. There's only one of me and many of you, and *also* lots of material to cover in a short period of time. This means that it can sometimes be challenging for me (and your TA) to address all questions in a timely manner during class while also delivering content at a fair pace. If your learning partners can help you spot the small (or maybe even large) things to get you past sticking points faster, that's a win for everyone!
3. Learning how to ask for help is a valuable skill. This includes understanding how to describe your issue succinctly and clearly.
4. Sharing your own knowledge and skills with others feels good! And the best way to learn something well is to explain it.
5. To be a successful data scientist, you'll need to work with, learn from, and collaborate with *many* different people throughout your careers. You'll probably find that your classmates bring different or complementary understanding, skills, and approaches to problems. Changing up who you work with each week is an easy way to better prepare yourself for the workforce.

Tentative Schedule

This schedule and proposed topics are subject to change! Please check the course website for the most up-to-date information.

Week #	Date	Topics	Assignments
1	Mon 1/6	Course logistics, Intro, `{ggplot2}` review	Pre-course reflection **(assigned)** Week 1 EOC survey **(due)**
1	Tue 1/7	Discussion #1 (data wrangling review)	Assignment #1 **(assigned)**
1	Sat 1/11	-	Pre-course reflection **(due)**

2	Mon 1/13	Graphic Forms, Fundamental Chart Types (Part I)	Week 2 EOC survey **(due)**
2	Tue 1/14	Discussion #2 (recreating USDM plot - graphic form)	-
2	Sat 1/18	-	-
3	Mon 1/20	NO CLASS (MLK Jr. Day)	-
3	Tue 1/21	Discussion #3 (writing alt text)	Assignment #2 **(assigned)** Assignment #1 **(due)**
4	Mon 1/27	Fundamental Chart Types (Part II)	Week 4 EOC survey **(due)**
4	Tue 1/28	Discussion #4 (recreating USDM plot - theme)	-
4	Sat 2/1	-	
5	Mon 2/3	Enhancing Visualizations (Part I)	Mid-course reflection **(assigned)** Week 5 EOC survey **(due)**
5	Tue 2/4	Discussion #5 (beyond fundamental chart types)	Assignment #2 **(due)**
5	Fri 2/7	Infographic Design using Affinity, Canva & Google Docs, with Dr. Alex Phillips *(attendance optional)*	-
5	Sat 2/8	-	Mid-course reflection **(due)**
6	Mon 2/10	Enhancing Visualizations (Part II)	Week 6 EOC survey **(due)**
6	Tue 2/11	Discussion #6 (saving plots)	Assignment #3 **(assigned)**
7	Mon 2/17	NO CLASS (Presidents Day)	-
7	Tue 2/18	Discussion #7 (peer feedback)	-
7	Sat 2/22	-	-
8	Mon 2/24	Data storytelling, People as data	Week 8 EOC survey **(due)**

8	Tue 2/25	Discussion #8 (peer feedback)	Assignment #4 **(assigned)** Assignment #3 **(due)**
9	Mon 3/3	OJS with Dr. Allison Horst (TBD)	Week 9 EOC survey **(due)**
9	Tue 3/4	Discussion #9 (peer feedback)	-
9	Sat 3/8	-	-
10	Mon 3/10	Grab Bag & Catch up	End-of-course reflection **(assigned)** Week 10 EOC survey **(due)**
10	Tue 3/11	Discussion #10 (practice presentations)	Assignment #4 **(due)**
10	Sat 3/15	-	End-of-course reflection **(due)**
11 (finals week)	TBD	-	Final in-person presentations **(due)**

Submitting Assignments

Homework assignments and their corresponding rubric (containing specifications for earning a "Satisfactory" mark) will be posted to the course website. Assignment materials will be posted and submitted via GitHub Classrooms (unless otherwise noted).

How will I be evaluated?

This class will implement an alternative grading approach called **specifications (specs) grading.** Read on to learn more about what that means and how it will work for EDS 240.

What is specifications (specs) grading?

While different instructors / courses may implement their own variation of specs grading, generally it refers to:

> "an alternative grading method where instructors create a list of *specifications* that describe the qualities and characteristics of a successful submission for an assignment. Student work is graded holistically based on those specifications, earning a single mark: "Satisfactory" or "Not Yet". Students have the chance to use feedback by revisiting and resubmitting for full credit."
>
> *- expert from "Grading for Growth: A Guide to Alternative Grading Practices That Promote Authentic Learning and Student Engagement in Higher Education", by David Clark & Robert Talbert*

Why use an alternative grading approach (and *not* traditional grading)?

"Traditional" grading (assigning points to one-time assessments and aggregating those points into a letter grade for a course) comes with a variety of challenges:

- It lacks feedback loops -- there are (often) no reattempts or revisions of work based on feedback, making it difficult for students to demonstrate (and instructors to assess) learning or growth
- It disproportionately benefits students who learn fast, or who already have familiarity with the material
- Traditional grades are bias-prone (e.g. awarding participation points, granting deadline extensions)
- It can be demotivating and discourage students from learning for its own sake (motivation often comes from "chasing the A," rather than learning and growing)
- It can promote unhealthy student-instructor relationships

How does specs grading look in practice for *this* course?

Specs grading for EDS 240 adapts the model used in Processes in Ecology and Evolution (BIO SCI E106), taught by Dr. Celia Faiola & Dr. Celia Symons during Winter 2022 at the University of California, Irvine.

- Each assignment will be accompanied by a clear rubric (containing specifications) which outlines what must be completed (and how) in order to receive a “Satisfactory” mark. Not meeting all specifications will result in a “Not Yet” mark.
- Students can trade “tokens” for the opportunity to revise and resubmit assignments that have received a “Not Yet” mark. Tokens may also be traded in for assignment extensions, or missing class (which is otherwise mandatory to attend).
- Students earn tokens (primarily) by attending discussion sections

Why tokens? And how do I redeem them?

I understand that everyone has different responsibilities and demands, both in and out of school. **Tokens give you the power and freedom to ask for the accommodations you need for your schedule.**

You *do not* need to provide a reason for an extension, resubmission, or to miss class, however **you must have enough tokens to request one**. I will not assume that you plan to trade in tokens for extensions, assignment resubmissions, or to miss class -- you must let me know of your intention to use them by filling out the Google form below:

Redeem tokens by filling out this Google form:
https://forms.gle/VtEaiqBvcayqUfMT8

Note: tokens are not limitless and they accrue weekly (i.e. you don’t receive them all at the start), so use them wisely! Only under extreme circumstances will we consider accommodating additional extensions, resubmissions, and missed classes if you run out of tokens (though please see the Sickness & Emergency Policy section, below) . **The first class of the quarter, (Monday, 01/06/2025) is mandatory, since you will not yet have earned any tokens (plus, we’ll be covering lots of important logistical information).**

Specifications grading allows you to take ownership of your own learning and define your own priorities.

The Grade Tracker, below (page 11), summarizes how you earn tokens. **Everyone begins with 0 tokens**. You will **earn your first token** by attending Discussion Section #1 (Tuesday 01/07/2025), and an **additional 2 tokens** upon completing and submitting Self-reflection (SR) #1. After that, you can **earn 1 token per week** by attending and participating in your discussion section. *You must attend the entire 50 minutes of discussion to earn your token.*

A summary of the class assessments which will determine your overall course grade, are provided in the Grade Tracker, below. You will use this tracker to determine your course grade. Please see UCSB's grading system to learn how the registrar converts letter grades to grade points.

See Grade Tracker on the next page

Grade Tracker

*Your grade is the highest category for which you meet **all** criteria.*

Assessments

Self-reflections (SRs)

- SRs are a place to reflect on your learning plan / goals, challenges, etc. **(total of 3 SRs)**

Homework Assignments (HWs)

- HWs are longer assignments where you will apply conceptual knowledge and technical skills to data visualization tasks **(total of 4 HWs, including a final HW presentation)**

End-of-Class Surveys (EOCs)

- EOCs are short surveys to help me better understand your class experience. They are to be completed by 11:55pm PT each Monday when class is held **(total of 8 EOCs)**

Class Attendance (CA)

- Class attendance (Mondays from 12:15 - 3:15pm) is mandatory **(total of 8 classes)**

Letter Grade

Receive a "Satisfactory" mark on the following:

A	B	C	D	F
4 HWs 3 SRs	3 HWs 3 SRs	2 HWs 2 SRs	1 HWs 1 SRs	0 HWs 0 SRs

Add a (+) to Letter Grade:	Letter Grade as-is:	Add a (-) to Letter Grade:
- Attend 8 classes - Submit > 6 EOCs	- Attend 8 classes - Submit 6 EOCs	- Attend < 8 classes - Submit < 6 EOCs

Earn Tokens by:

- Completing SR #1 **(2 tokens)**
- Attending discussion section **(up to 1 token / week; must attend *full* session)**

Exchange Tokens for:

- 24hr extension **(1 token)** or 72hr extension **(2 tokens)** on any HW *or* SR *(may extend submission deadline a maximum of 72hr per assignment)*
- Revise / resubmit a HW within one week of its return **(2 tokens)**
- Miss one class **(2 tokens)**

Grade Tracker inspired by the syllabus for BIO SCI E106 Lec A (Processes in Ecology and Evolution, Winter 2022), by Dr. Celia Faiola & Dr. Celia Symons

Sickness & Emergency Policy

If you are feeling ill or experiencing a personal or family emergency, please contact the instructor to arrange accommodations. You will not be charged tokens for an unanticipated illness or emergency, but you are expected to connect with the instructor to devise a plan that ensures you've completed the necessary instruction / work. Generally, you should be prepared to review the lecture and / or discussion materials on your own, then attend student hours (or make an appointment) if you have additional clarifying questions.

Policy on Generative AI

Adapted from policy for EDS 220 & EDS 223, developed by Dr. Carmen Galaz-Garcia & Dr. Ruth Oliver, and The University of Texas at Austin's Center for Teaching and Learning

Understanding how and when to use generative AI (GenAI) tools (such as ChatGPT, DALL-E) is quickly emerging as an important skill for data science professionals (and beyond). To that end, **you may use GenAI tools in this class as long as it aligns with the learning outcomes or goals associated with assignments**. You are fully responsible for the information you submit based on a GenAI query (such that it does not violate academic honesty standards, intellectual property laws, or standards of non-public research you are conducting through coursework).

Some examples of when the use of GenAI tools *is permitted* in this course include:

- Troubleshooting code or technical issues
- Fine-tuning your research question
- Finding information on your topic
- Clarifying your own prose

Examples of when the use of GenAI tools *is not permitted* in this course include:

- Writing code wholesale
- Drafting written portions of assignments
- Writing entire sentences, paragraphs or blog posts

Your use of GenAI tools must be properly documented and cited for any work submitted in this course. Please include an appendix at the bottom of (or otherwise attached to) any submitted work, which documents:

a. which AI tool(s) (e.g. ChatGPT private subscription version, DALL-E free version) you used
b. an explanation of how the AI tools were used (e.g. to generate ideas, improve clarity of prose, troubleshoot code)
c. an account of why AI tools were used (e.g. to save time, stimulate thinking, handle mounting stress)
d. how you validated the output of your chosen GenAI tool before incorporating it into your work

Ultimately, **GenAI is a tool, and it should not serve as a substitute for understanding our code, including what we are trying to accomplish and why we select certain approaches, practicing critical thinking skills, and building core competencies**. AI tools should be used wisely and reflectively with an aim to deepen understanding of subject matter.

Assignments that make a low-energy or unreflective use of GenAI will receive "Not Yet" marks. Not acknowledging use of GenAI in assignments will result in a "Not Yet" mark for the assignment -- additionally, the assignment will not be eligible for a revise / resubmit regardless of available tokens.

Conduct, Inclusion and Accommodations

Course conduct: We are committed to actively creating, modeling, and maintaining an inclusive climate and supportive learning environment for all course participants (including instructors, guests, and students). We expect everyone to treat every member of our learning community with respect. Harassment of any kind will not be

tolerated. Everyone is expected to read and adhere to the Bren School Code of Conduct, and the UCSB Code of Conduct.

Access & accommodations: It is never too late to apply for DSP accommodations. If you have any kind of disability, whether apparent or non-apparent, learning, emotional, physical, or cognitive, you may be eligible to use formal accessibility services on campus. To arrange class-related accommodations, please contact DSP. DSP will initiate communication about accommodations with faculty. By making a plan through DSP, appropriate accommodations can be implemented without disclosing your specific condition or diagnosis to course instructors.

Name and pronouns: Everyone has the right to be addressed and referred to by name and pronouns in accordance with their identity. By default, the UCSB Registrar roster only includes students' legal names**,** but your profile can be updated with pronouns - which I encourage you to do.

Student Resources

There are *many* on-campus resources for helping students navigate different challenges and/or grow community. I am always available to discuss your individual needs and help guide you towards a campus resource that may be best suited to your situation. A number of those resources are listed, below:

Basic Needs Resources & Food Insecurity

UCSB has a dedicated team for helping students navigate and find help meeting basic needs. Explore the Basic Needs Resources web page for more information on their many resources, including information on the CalFresh Program and The Associated Students food bank.

- **NOTE: Booking an appointment with a CalFresh representative or Basic Needs Advising counselor is highly recommended!**
    - You can schedule a CalFresh Appointment for help starting an application or receiving guidance on applying for CalFresh

- Schedule a Basic Needs Advising Session to help identify which basic needs resources might be the best fit for your needs / information on how to access those resources
- See the Basic Needs Resources page for other appointment options

Counseling and Psychological Services (CAPS)

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. CAPS is available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus. They can be reached by phone at 805.893.4411, or online at http://caps.sa.ucsb.edu. The CAPS building is the pink building next to the Humanities and Social Science building (HSSB)

Resource Center for Sexual and Gender Diversity (RCSGD)

Located in the Student Resource Building (SRB), RCSGD offers a host of services for LGBTQ+ students, including a library and many events throughout the year. Learn more at: https://rcsgd.sa.ucsb.edu/

Undocumented Student Services (USS) Program

The USS Program and associated Dream Scholars Resource Team (DSRT) offer workshops, help students find scholarships and financial support, and work to provide community for undocumented students. Learn more at: https://uss.sa.ucsb.edu/

Campus Learning Assistance Services (CLAS)

CLAS helps students grow academically by offering workshops, walk-in and pre-scheduled tutoring, and writing help both for native and non-native (ESL) English as a second language speakers. Over 50% of students will stop by CLAS at one time or another. http://clas.sa.ucsb.edu

Student Resource Building (SRB)

The SRB houses many campus resources offices, including the African Diasporic Cultural resource Center, the American Indian Resource Center, the Asian Resource Center, the Middle Eastern Resource Center, the Non-Traditional and Re-Entry Student Resource Center. http://www.sa.ucsb.edu/student-resource-building/home

Multicultural Center (MCC)

The MCC, located in UCEN, hosts a wide variety of cultural events and educational programming throughout the year, including film showings, lectures, musical performances, and more: http://mcc.sa.ucsb.edu/

Campus Advocacy, Resources, & Education (CARE)

CARE offers 24/7 confidential support and advocacy in situations of sexual assault, dating and domestic violence, and stalking. Located in the SRB, they can be reached at 805.893.4613 or http://wgse.sa.ucsb.edu/care/home

Financial Crisis Response Team

If you are experiencing issues of housing insecurity contact the Financial Crisis Response Team at financialcrisis@sa.ucsb.edu to begin application for assistance.

Health and Wellness

Student well-being is integral to academic success, student development, and life satisfaction. On this website, students will find links to a range of services related to well-being such as: assistance with basic needs (food, housing, finances); counseling and physical health resources, daily wellness centers and programs; social connection, and personal safety. https://wellbeing.ucsb.edu/