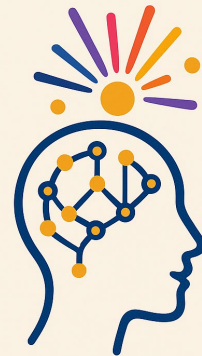


Teaching Data Visualization in R with Generative AI

Alana Unfried
California State University Monterey Bay



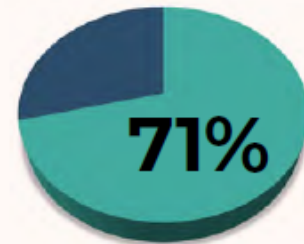
**Sparking
Joy and
Discovery**
In a World of AI
eCOTS 2026

Generative AI is Changing How we Code

- Generative AI can write code!
 - Posit: [which model writes the best R code?](#)
 - Duke: [Getting started with GenAI for R](#)
- Implications for teaching statistics and data science courses that integrate learning to write code

AI misalignment for students (and faculty)

- A misalignment between what may be expected in the workforce and how they are asked to engage with AI in school
 - “Coding After Coders: The End of Computer Programming as We Know It”



71% of leaders are more likely to hire a less experienced candidate with AI skills than a more experienced one without them

<https://studentguidetoai.org/> 2024 report; from 2024 work trend survey

What Competencies are Needed Now?

- Student Guide to AI highlights a “two-part career plan for the age of AI”



1. Strengthen your human capabilities

Human skills needed in the workforce:

- Critical / Analytical thinking
- Creativity and innovation
- Emotional intelligence
- Ethical Judgment
- Strategic Thinking
- Leadership and Collaboration



2. Become AI-literate

AI skills needed in the workforce:

- Fundamental AI skills
- Technical Understanding
- Professional AI application
- AI integration

My Solution for teaching Data Viz

- **Integrate generative AI in courses where it made the most sense:**
 - Data Visualization with R
 - Goal is great visualizations, not expert programming skills
- **Scaffolded approach:**
 - Teach students the basics of RStudio, the R language, and ggplot
 - Then explore how genAI can be a tool, not the driver

Integrating AI into Data Visualization with R

1. What is GenAI?

- Read [Student Guide to Artificial Intelligence](#) (2024)
- Define terms
- How it works
- Why we should engage

2. AI Ethics

- [Mapping the Ethics of Generative AI: A Comprehensive Scoping Review](#) ([AI Ethics Tree](#))
- Cite your use on every assignment

3. AI Tools for R Code

When engaging is worth it, here are some options:

- ChatGPT Projects
- Rtutor.ai
- GitHub Copilot
- Shiny Assistant

4. Checking your/its Work

- Give students R code from a ChatGPT dataviz prompt
- Ask them to find where it went wrong

Student Guide to AI

- Reading assignment prior to class

The AI revolution

AI is transforming our world, often in ways we may not fully realize. This guide empowers students to navigate the age of AI – academically, professionally and ethically. Understanding AI isn't just useful; it's essential. Learn to use AI responsibly, critically assess its capabilities and join the conversation about its future.

The Student Guide to AI series

This is the second publication of the Student Guide to AI series produced by Elon University and the American Association of Colleges and Universities (AAC&U).

- [Get the 2024 Student Guide to AI](#)
- [More at www.studentguidetoai.org](http://www.studentguidetoai.org)

This series is a response to the statement of principles, “Higher education’s essential role in preparing humanity for the artificial intelligence revolution,” released at the United Nations Internet Governance Forum in Kyoto, Japan, in October 2023.

The statement called for higher education to “engender an understanding of responsible AI development designed to augment and enhance human capabilities rather than replace them.”

Endorsed by:

- [American Library Association](#)
- [NASPA](#)
- [EDUCAUSE](#)
- [Online Learning Consortium](#)
- [AMICAL Consortium](#)

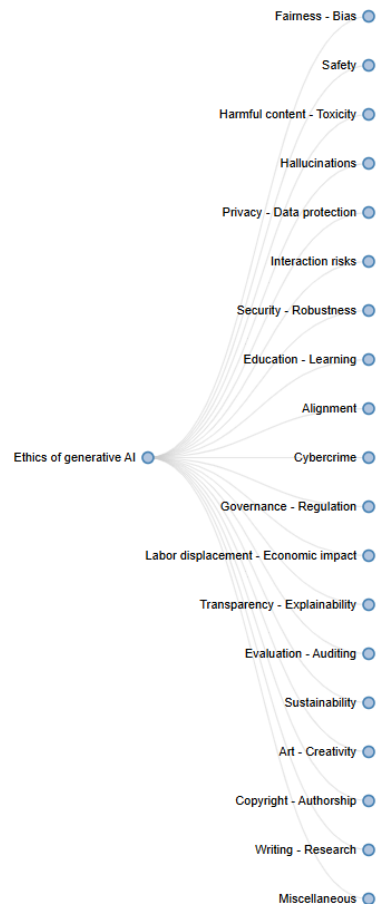
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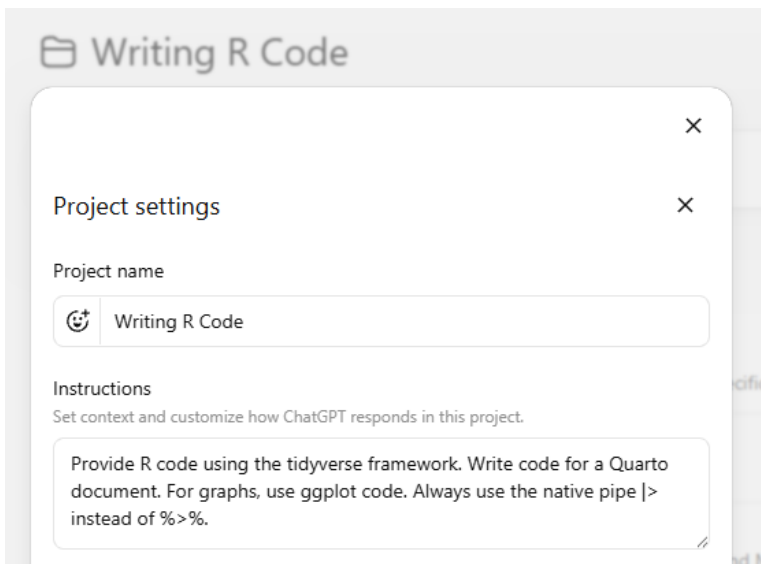
GenAI Ethics

- [Tree Diagram](#)
- [Journal Article](#)
- Each group chooses one tree branch to explore and summarize for the class
- We discuss
 - Model collapse
 - Current events around AI ethics
 - Erosion of social interactions, deepfakes, etc



Teaching ChatGPT

- Teach ChatGPT projects to give custom instructions



Writing R Code

+ New chat in Writing R Code

Thinking ▾



Chats Sources

New chat

using the rpart function, how do I specify how to prune the decision tree to a specific level/value?

Apr 28 ...

Quarto Formatting

How do I modify to suppress the confidence interval?

Apr 28 ...

New chat

* installing *source* package 'rlang' ... ** package 'rlang' successfully unpacked and MD5 sums checke...

Apr 28 ...

ROC Curves with Missing Data

roc curves in r with missing data

Apr 6 ...

uses Chart

graph where I group by the pre/post variable. How do I get the items to appear i...

Mar 16 ...

tudents

such that email is the unique ID. Data is in long format for pre and post respons...

Mar 16 ...

ns

to I list the first and last column numbers to use

Mar 15 ...

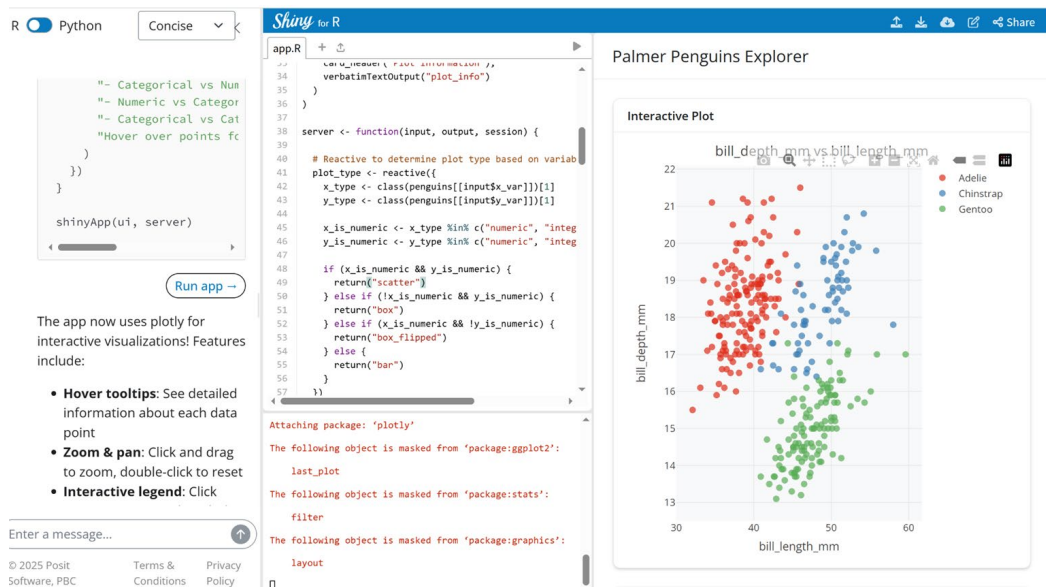
A

number of non-missing values in each column?

Mar 9 ...

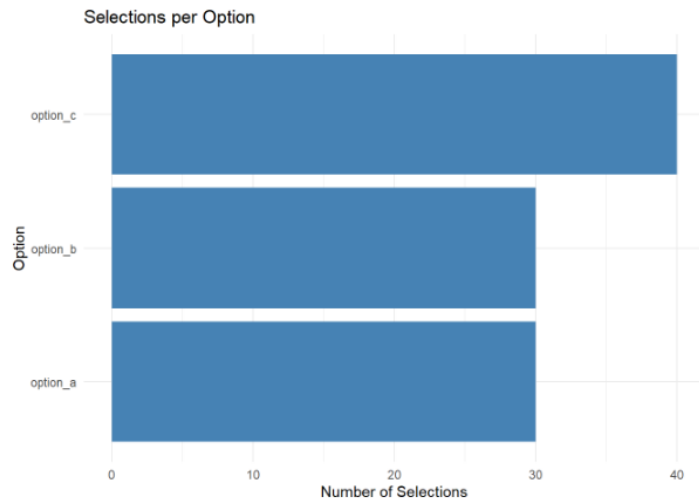
Beyond ChatGPT: Rtutor.ai, GitHub Copilot, Shiny Assistant

- Introduced each one a couple weeks apart after ChatGPT
- Demonstrated in class but did NOT require student use
- Students were shocked by how quickly these tools produced code identical to code they had worked on for weeks
 - **Shiny Assistant:** *I want to create a Shiny app of the Palmer Penguins data that lets me choose which variables to graph together. Based on the variable types it should automatically decide which type of graph to use. Add plotly to make each chart interactive. [Creates this app](#)*



Check your Work

- **In class activity:** Give them code generated by ChatGPT that creates and inaccurate graph and task them with identifying the problem
 - They really struggled with this



7. By hand/calculator, calculate the **percent** of respondents that chose option a, option b, and option c. Do these percents match what is shown in the graph? Does the graph appear to solve the problem that I prompted?

A: $3/5=60\%$. B: $3/5=60\%$, C: $4/5=80\%$ These do NOT match what is shown in the graph, the graph does not correctly solve the problem that I prompted.

8. Where did ChatGPT go wrong? Look at each section of the code (and/or run various pieces of it) and explain where you think ChatGPT made a mistake.

It filtered in the pivot_longer to only include YES responses instead of those who said no; when it then calculated the proportions, it totaled this number of YES responses (1's) in the data as the denominator (10 total), instead of totaling 1's within each option and dividing by the number of respondents (5). We need the filter to be applied AFTER we calculate the proportions.

9. Now it's your turn. Using the same example dataset that ChatGPT generated, can you edit or write new code to correctly graph the **percent** of respondents that selected each options? Be sure to comment your code to explain what it is doing. You can use the original ChatGPT code as a starting point.

AI Policy on each Assignment

-  **AI tools for code:** You may make use of GenAI for help with code; if you do so, you must explicitly cite where you obtained the code. Any recycled code that is discovered and is not explicitly cited will be treated as plagiarism. You can use [these guidelines](#) on how to properly cite genAI.
-  **AI tools for narrative/text:** Unless instructed otherwise, you may not use generative AI to write your narrative/text. "The process of writing is actually the process of thinking.... I want to read what humans think!" ([Andrew Heiss](#).) Any text that is discovered to be generated by AI rather than written by your team will be treated as plagiarism.
- AI should be a tool you use selectively, NOT at the cost of your own critical thinking and design.
- Dr. U reserves the right to verbally ask you about any code that you have written. You should be able to explain ALL code that you are including in your final dashboard and it should be WELL DOCUMENTED, even if AI assisted you.
- You are ultimately responsible for the work you turn in; it should reflect *your* understanding of the course content. (*Thanks to [Mine Cetinkaya-Rundel](#) for the foundation of this policy.*)

Students Cite AI Sources in Assignments

● Example on final dashboard assignment

Shot Quality vs. Quantity: Visualizing What Leads to Goals and Wins in Hockey

Introduction

The More the Better

Where to Shoot From

Resources

Generative AI & Resources

-Generative AI

Generative AI was really helpful for this project, especially while utilizing interactivity on my visualizations and cleaning data. Chat GPT (GPT-5) was used when trying to create the hockey shot map. My data only had summary counts of shot statistics and no coordinates for plotting shots by exact location. In order prep my data to create the visualization I had in mind, I described my data set to Chat GPT. "My dataset is one row total with total counts of all shots by location and their outcome. I do not have location/coordinate points for the shots. I want to make a map of each single shot using geom_hockey and have it plotted randomly by location (inner or outer slot)." After prompting Chat GPT with this, I was returned an explanation on how I can begin creating my visualization. "This is totally doable without exact coordinates- you just have to make some fake x/y positions inside the "inner slot" and "outer slot" regions and then plot them. The game plan is: -Start from your summary table -Create tibble with variables for each shot location and outcome -Expand it to one row per shot using tidyr::uncount() -Assign random x/y coordinates based on slot location -Plot on geom_hockey" (GPT-5)

It then displayed example code utilizing the case_when() function and setting each slot location to the runif() function to randomize the points. I then set the runif() limits to the range of location for each inner or outer slot shot. This took a lot of trial and error to get the inner and outer slot shots in the locations I wanted. The explanation for using case_when() rather than if else statements, was that it would require multiple if else statements and case_when() is used when we want to create new variables. In short, I wanted to create x and y coordinates for each shot, so if the location was inner it would create the x and y coordinates within the range of randomized min/max values for inner shots. After prompting GPT with this, I was able to construct another tibble on my own when creating my third visualization. This was the most meticulous aspect of creating my visualizations and I do not think I'd be able to figure it out on my own.

Sources

-Sources

OpenAI. (2025). ChatGPT (GPT-5) [Large language model]. OpenAI. <https://chat.openai.com/>

"forcats: Tools for Working with Categorical Variables (Factors)." forcats.tidyverse.org, <https://forcats.tidyverse.org>.

"geom_hockey (sportyR)." Rdrr.io, https://rdrr.io/cran/sportyR/man/geom_hockey.html.

Gohel, David. "girafe." ggiraph Reference, <https://davidgohel.github.io/ggiraph/reference/girafe.html>.

"ggplot2: layer_positions." ggplot2.tidyverse.org, https://ggplot2.tidyverse.org/reference/layer_positions.

"Introduction to ggiraph." Ardata, <https://www.ardata.fr/ggiraph-book/intro.html>.

Kabacoff, Robert. "Interactive Data Visualization." rkabacoff.github.io, <https://rkabacoff.github.io/datavis/Interactive.html>.

Pardavila, Joe. "The Other Half of 'You Miss 100% of the Shots You Don't Take' | by Joe Pardavila | Medium." Medium, medium.com/@joepardavila/the-other-half-of-you-miss-100-of-the-shots-you-dont-take-2290b433b7fd.

R Programming 101. "Quarto Dashboards" YouTube, <https://youtu.be/Dd3mNzq6tXI?si=SGwUsd9HMI22Y0mj>.

Unfried, A (2025) Interactivity in Visualizations[Lecture notes]. STAT-310 Data Visualization, California State University Monterey Bay

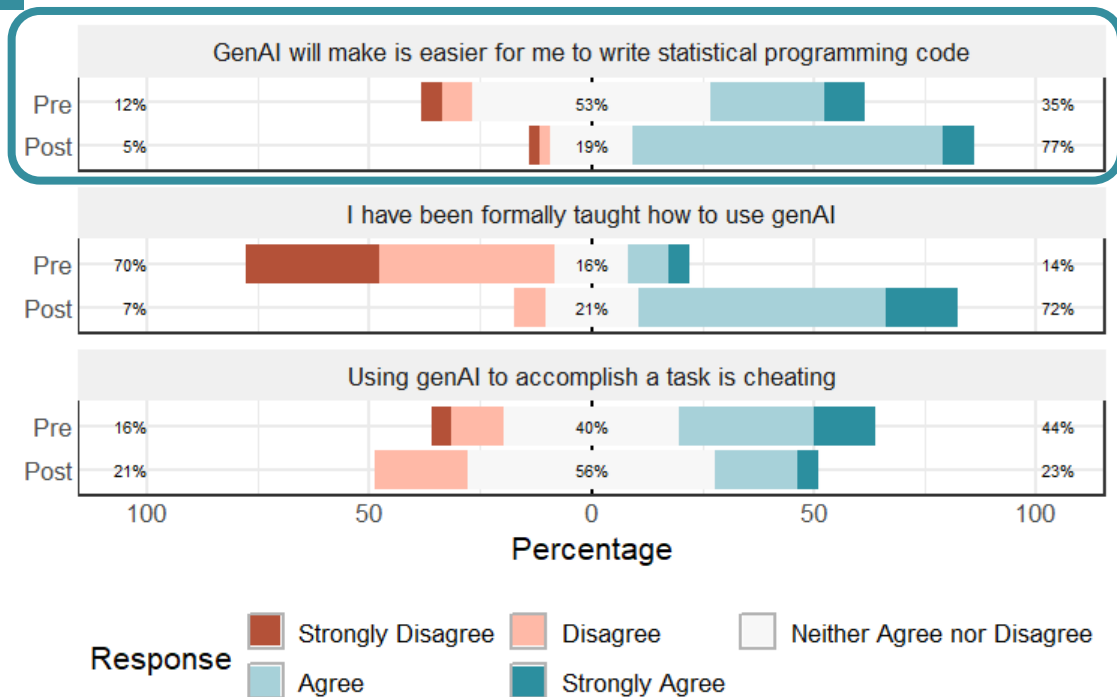
Unfried, A (2025) Storytelling with Dashboards [Lecture notes]. STAT-310 Data Visualization, California State University

Student Response:

Pre / Post GenAI Attitudes

Selected Survey Results

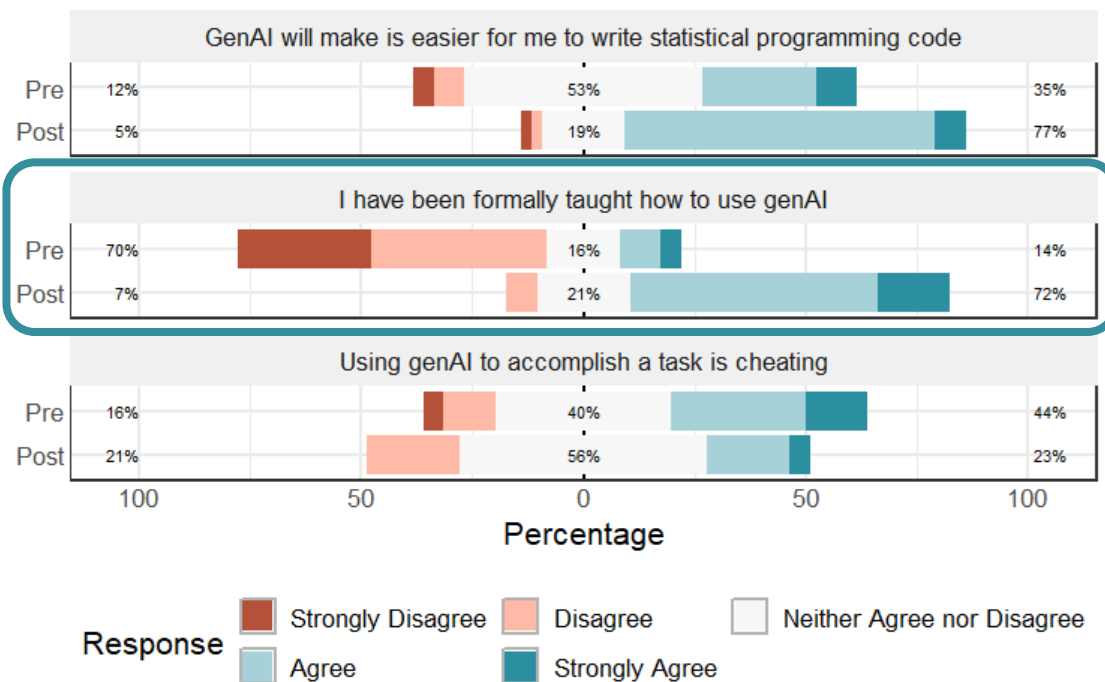
n=43 complete pre/post cases



Student Response:

Pre / Post GenAI Attitudes

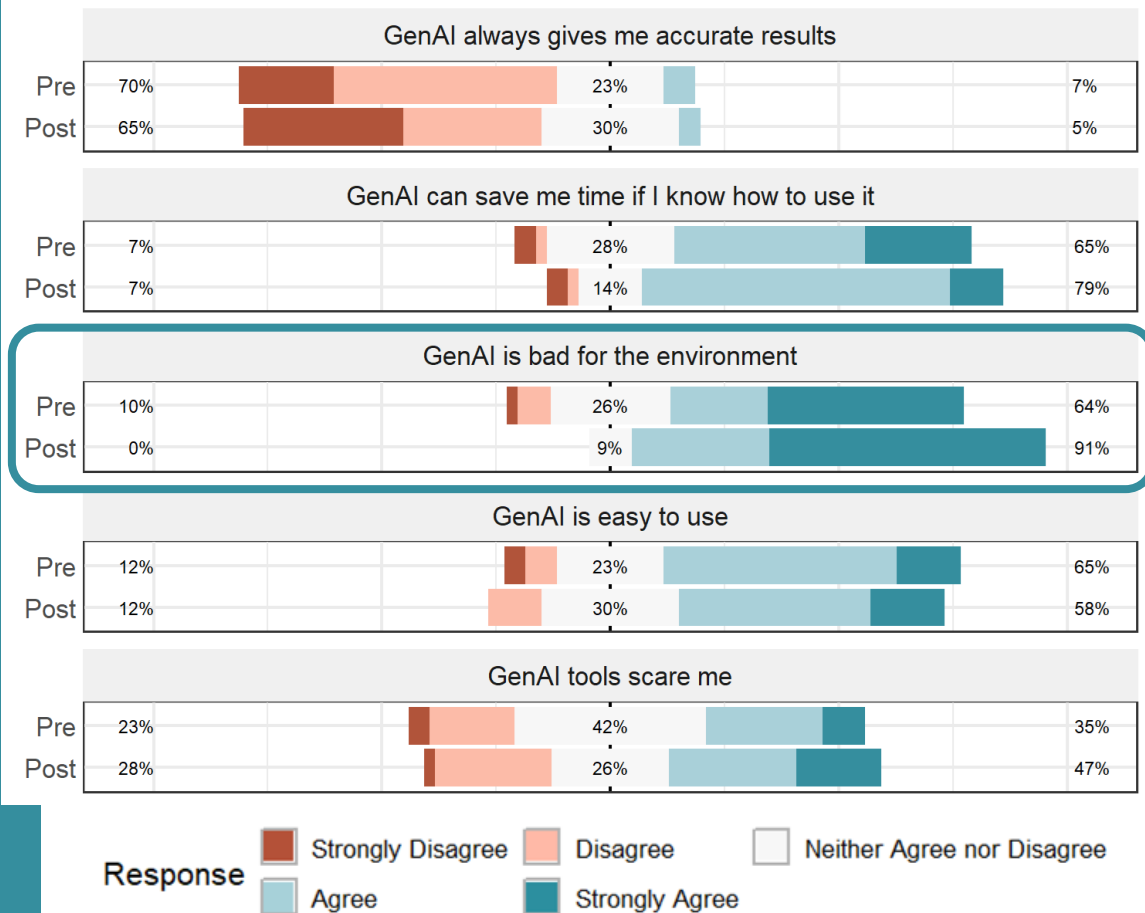
Selected Survey Results



Student Response:

Pre / Post GenAI Attitudes

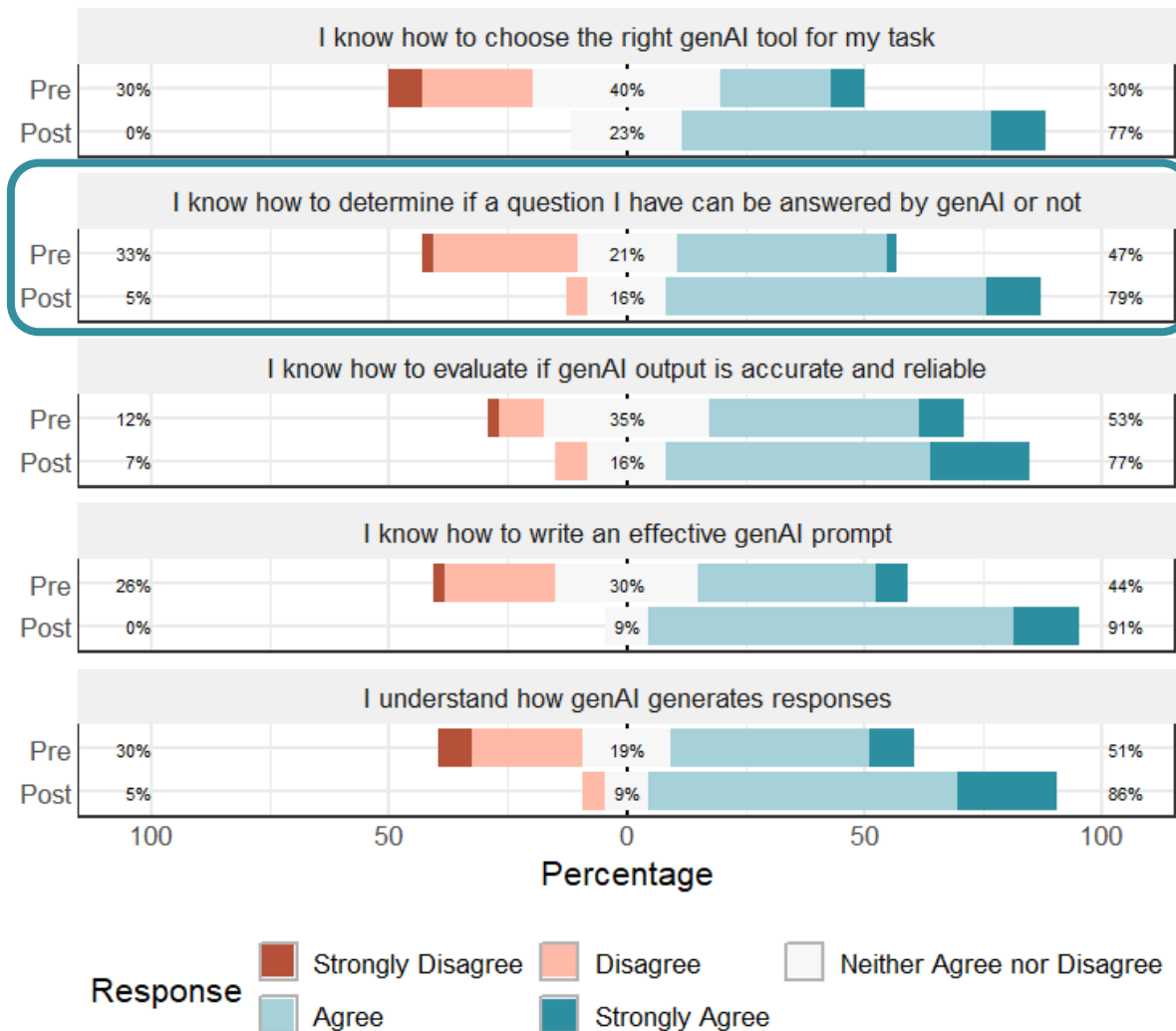
Selected Survey Results, Part 2



Student Response:

Pre / Post GenAI Competencies

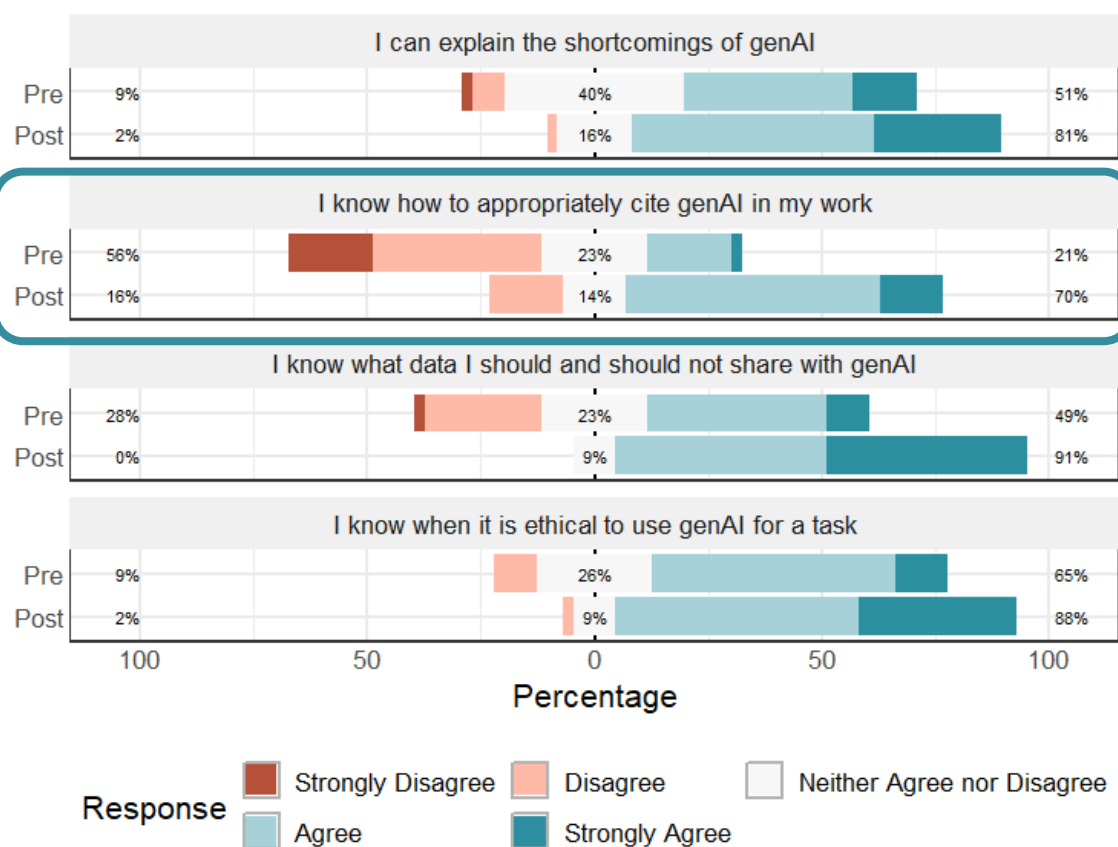
Selected Survey Results



Student Response:

Pre / Post GenAI Competencies

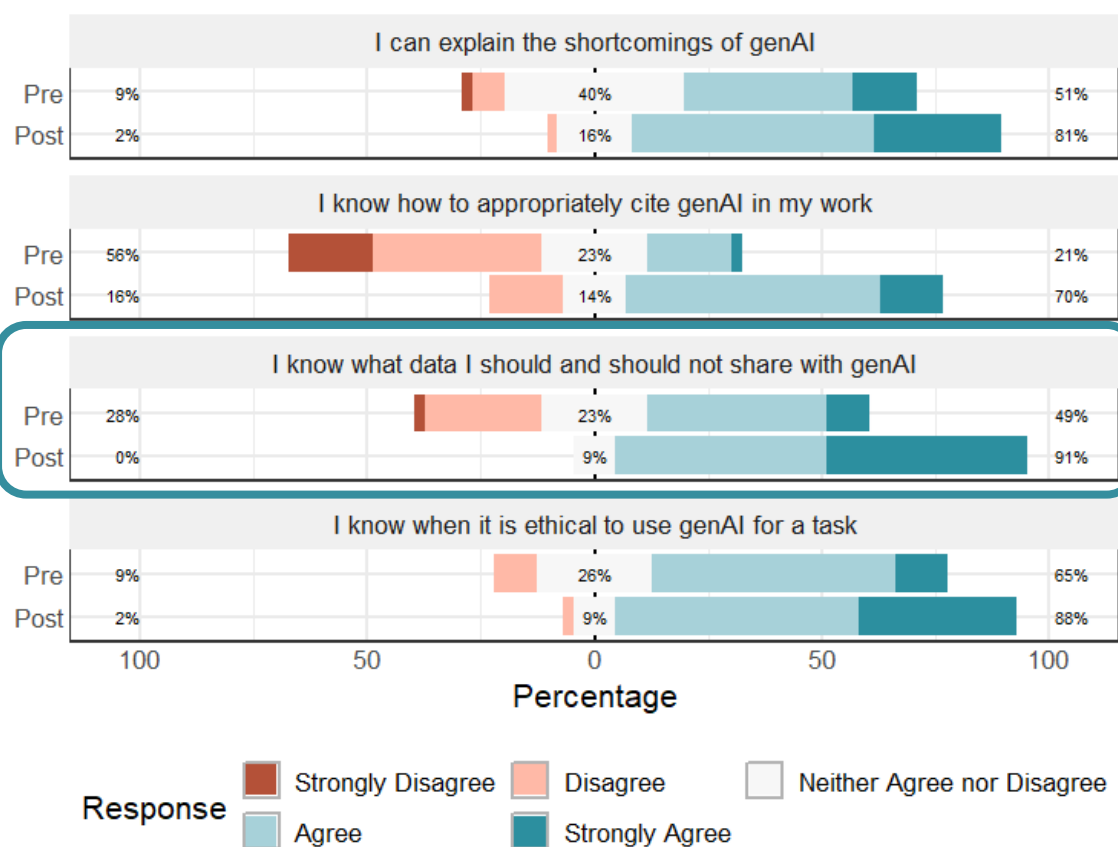
Selected Survey Results, Part 2



Student Response:

Pre / Post GenAI Competencies

Selected Survey Results, Part 2



Student Response to AI and Curriculum Changes

AI Reflection Assignment

- Students still desire to use their own brains

Course Evals - “Would prefer less AI and more just learning how to code”

Anecdotal - “This is the only class where I’ve actually been taught how to use AI”

Future Work

- **New AI Tools**
 - Try Posit assistant in RStudio
 - Explore Codex, Claude Code, etc
- **Build assignments that require the use of genAI**
 - Require opt-out and alternative assignment for students who are opposed

Thank you!

Let's talk!

Alana Unfried aunfried@csumb.edu

