

# Students’ Statistical Thinking when Using Generative AI: A Descriptive Case Study

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## INTRODUCTION

- Generative AI tools support learning and problem-solving, but their impact on statistical thinking needs further exploration.
- Generative AI tool can help lower technical barriers while maintaining analytical standards<sup>1</sup>.
- There are concerns about whether AI tools foster passive reliance or enhance understanding in statistics<sup>2</sup>.
- This study examines how AI-assisted data analysis, specifically tools like Rtutor.AI, influences students' statistical thinking and problem-solving.

## AIM

- Understanding tool usability:
  - How do students interact with Rtutor.AI to complete statistical tasks?
  - What strategies do they use when creating prompts, interpreting outputs, and refining analyses?
- Evaluating impact on cognitive processing:
  - Does Rtutor.AI facilitate or hinder students' statistical reasoning?
  - How does prior statistical knowledge shape their ability to leverage AI effectively?

## RESULTS

THEME:

STUDENT QUOTE:

Engaging in planning, monitoring, evaluation, and revision

"I figured after that, it would just kind of give me a base, and then after that, I can make it more specific and then go off of what else the other instructions and ... [what] I wanted to do."

Building statistical thinking through a step-by-step process

"Seeing each step helps me think about what I should do for the next step or what I should fix in that step."

Identifying key elements of a problem to create specific prompts

"I'm afraid that if I don't have quotes ... [Rtutor.AI] just won't know what to do with it."

Lowering barriers to completion of statistical tasks

"I honestly thought [Rtutor.AI] was helpful because ... [you] just write in what you need, and ... it does give you what you need."

Prior knowledge and preferences shaping engagement with AI

"I don't know. I don't really understand what ACT score has to do with the school, but that might just be me. I don't know how to really explain that."

Dataset: Upload

Upload 2nd file

Browse... No file select

2. Data Types

Edit

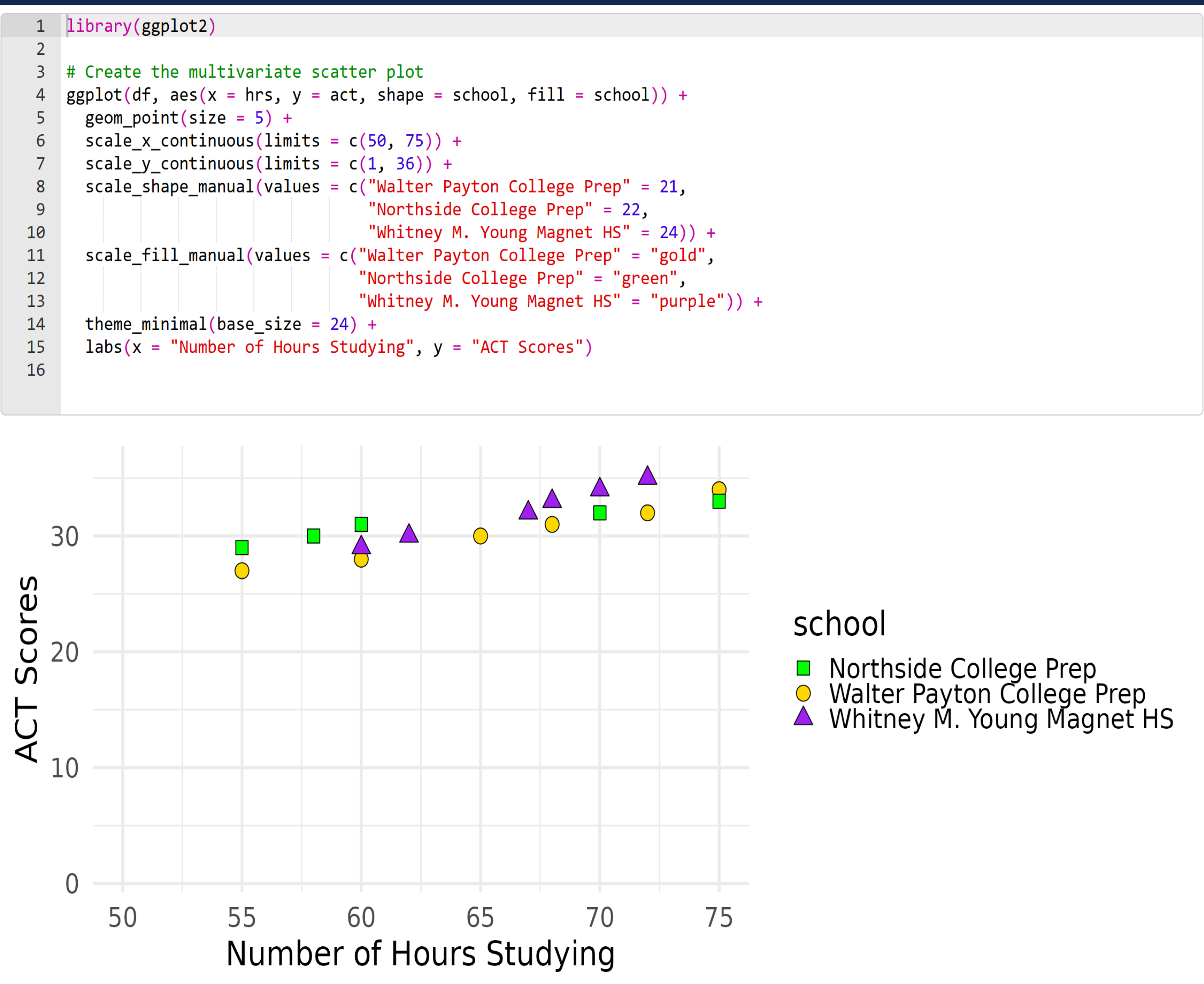
3. Prompt

Create a multivariate scatter plot for the data. Put number of hours studying on the x-axis and make the range on the x-axis from 50 to 75. Put ACT scores on the y-axis and make the range on the y-axis from 1 to 36. Make data points from "Walter Payton College Prep" with solid gold circles. Make "Northside College Prep" green squares. Make "Whitney M. Young Magnet HS" purple triangles.

Submit Reset

Ask About Results

Q&A on code, results, error, or statistics in general



## METHODS

- Design: Descriptive case study with semi-structured task-based interviews
- Participants: 5 undergraduate students intentionally sampled based on their performance (A, B, or C/D grades) from an introductory statistics course
- Task: Students created a multivariable scatter plot using Rtutor.AI to analyze school performance data (ACT scores vs. study hours).
- Analysis: Thematic analysis of interview transcripts to identify patterns in students' statistical thinking and problem-solving.

## CONCLUSION

- Rtutor.AI is an effective tool for students with strong foundational statistical knowledge.
- AI tools like Rtutor.AI support reflective statistical thinking but cannot compensate for lack of conceptual understanding.
- Generative AI tools should supplement - not replace – direct instruction in statistical reasoning.

## REFERENCES

- Woodard, V., & Lee, H. (2021), "How Students Use Statistical Computing in Problem Solving," *Journal of Statistics and Data Science Education*, 29(sup1), S145–S156
- Habib, S., Vogel, T., Anli, X., & Thorne, E. (2024), "How does generative artificial intelligence impact student creativity?," *Journal of Creativity*, 34(1), 10007.

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