AI-Assisted Statistical Writing in a Quantitative Research Methods Course

Lisa S. Romero, California State University Sacramento, lisa.romero@csus.edu

CONTEXT

Many graduate students in the social sciences find quantitative methods to be one of the most challenging courses they take. Mastering basic statistics requires not only understanding and manipulating data but also selecting and executing appropriate statistical tests. However, just as critical as these mechanics is the final step—making sense of the results and effectively communicating their real-world implications. Despite its importance in applied fields, statistical writing receives little emphasis beyond reporting significance levels, leaving many students with procedural knowledge but without the ability to clearly convey the practical significance of their findings.

This lesson was designed to address that gap within an introduction to quantitative research methods course in a Doctor of Educational Leadership (EdD) program. The course introduces students to basic statistics, data analysis, and interpretation. This lesson integrated AI tools such as ChatGPT and Claude to enhance students' statistical writing and interpretation skills. It was introduced following a unit on t-tests for examining group differences in means, reinforcing students' ability to not only conduct statistical tests but also to communicate their findings, and the implications for leadership and data-driven decision making.

Before the course began, students were surveyed about their prior knowledge and experience with statistics and generative AI. Many students reported having limited experience with statistics and data analysis, with some expressing anxiety or uncertainty about their ability to succeed in the course. Several students noted that they had never used statistical software such as SPSS and were concerned about making errors in their analyses.

When asked about AI, responses varied. Some students had already experimented with AI tools for tasks such as brainstorming or writing text, while others had little to no exposure. Several students were uncertain about the ethical boundaries of AI use, with questions about what constituted appropriate academic use versus potential academic dishonesty. Others expressed curiosity but were unsure how to use AI effectively. These responses highlighted the need for explicit instruction on AI literacy and ethical considerations along with its practical applications in academic writing and data analysis.

LEARNING OBJECTIVES

By the end of this lesson, students were expected to:

1. Utilize AI to support the articulation and interpretation of statistical findings.
2. Clearly communicate statistical results in writing to both technical and non-technical audiences.
3. Build skill and confidence in the use of Large Language Models (LLM) to assist with learning statistical concepts and AI-assisted writing.
4. Engage in critical discussions about the effective use of AI in educational research and decision-making.

DESCRIPTION OF ASSIGNMENT OR ACTIVITY

The lesson consisted of four sets of activities that students completed sequentially: first, online asynchronous lessons to build background knowledge about generative AI, then an in-class demonstration by the instructor, followed by paired practice with a hands-on exercise, and finally an independent homework assignment.

The asynchronous AI learning modules that students completed, covered:

- An introduction to AI and foundational Large Language Models
- Effective uses of AI in education and learning
- AI challenges (e.g. bias, hallucinations), ethical considerations, and responsible use
- Crafting effective prompts

Students were required to create accounts on ChatGPT and one other generative AI platform (e.g. Claude). They also engaged in reflective questions on online (Canvas) discussion boards.

This was followed by an in-class demonstration. Students were shown how AI could be used to answer questions (e.g. explain standard deviation, give me an example), select appropriate analyses (e.g. what kind of t-tests should be used), and interpret results of statistical analyses (help me understand these t-test results). Prompting strategies for writing, editing, and improving drafts were illustrated. The session also included examples of some pitfalls and biases.

Students then worked in pairs to explore how AI could help them with statistics questions, interpretation of output, and writing to explain results.

For the homework assignment, students selected one of two scenarios based on their concentration:

- K-12 Scenario: Students analyzed high school attendance data to evaluate the effectiveness of an attendance intervention program. The scenario placed them in the role of an Associate Superintendent tasked with determining whether a costly initiative—hiring Attendance Intervention Specialists—had a measurable impact on student attendance. They compared attendance data from a high school that implemented the intervention with a similar school that did not, using SPSS to conduct appropriate t-tests and descriptive analyses. Their findings were used to craft a professional memo to the Superintendent, explaining their results, the statistical significance of the differences, and policy recommendations based on their analysis. Students were required to clearly balance their data-driven recommendations with real-world policy considerations, particularly since media coverage and school board pressure were influencing decision-making in this scenario.
- Higher Education Scenario: Students assessed the impact of a student engagement and retention initiative designed to support non-traditional students. The scenario positioned them as an Associate Vice President at a university, analyzing whether an initiative targeted at students over 25 significantly reduced dropout/fail/withdrawal (D/F/W) rates. Using SPSS, students conducted descriptive analyses, and appropriate t-tests to compare retention rates before and after the intervention, as well as between students in the program and a control group. Their task was to communicate statistical results in a way that was accessible to both non-technical administrators and data-literate stakeholders. The challenge was to determine whether the intervention's success warranted permanent funding beyond its initial grant period. In their memos to the university President, students not only reported statistical findings but also discussed cost implications and the broader institutional impact, reinforcing the importance of using quantitative data to drive leadership decisions.

Students performed statistical analyses and wrote professional memos summarizing their findings. AI tools were used to assist in structuring and refining the memos, ensuring clarity for both technical and non-technical stakeholders. Each student submitted their:

1. Final memo
2. Prompts and AI-generated drafts
3. SPSS output
4. Reflection on their use of AI in the writing process.

Students could also complete an additional optional exercise of using AI to analyze the data and compare results, process, and learning experience with those of the required assignment.

EVIDENCE OF STUDENT LEARNING

Student engagement with the AI modules and assignments demonstrated significant learning. The discussion board responses reflected a range of perspectives, from enthusiasm about AI's potential to concerns about ethical implications.

Some students were initially skeptical of AI's role in academic writing but found that it helped them structure their work and clarify their statistical interpretations. Others expressed initial concern about over-reliance on AI or its potential biases, but after experimenting with different prompts, they began to see its value in organizing their thoughts and refining their writing. Several students emphasized that human oversight was essential in ensuring AI-generated content was accurate and aligned with their intended meaning.

Students used AI not only to generate draft memos but also to refine their language, ensuring their findings were communicated effectively to both technical and non-technical audiences. Some used AI to generate an initial draft that structured their analysis logically, while others relied on AI to simplify complex statistical interpretations for stakeholders unfamiliar with data analysis. One common observation was that AI was particularly helpful in reframing content for different audiences, allowing students to adjust their messaging based on whether they were addressing a school board, a superintendent, or a university administrator.

CONCLUSIONS AND REFLECTIONS

This lesson successfully integrated AI into statistical writing, enabling students to understand and communicate data findings with greater clarity. Key takeaways included:

- Bridging the gap between statistics and leadership: Students practiced using AI to help them translate data into actionable insights by writing memos for superintendents or university presidents.
- AI as a tool, not a replacement: Students acknowledged AI's utility but recognized the importance of human judgment in editing and verifying AI-generated content.
- Need for ongoing AI literacy: While many students successfully used AI, others struggled with prompt engineering, indicating a need for continued AI literacy education.
- Increased confidence in AI use: By the end of the lesson, students reported feeling more comfortable and confident in their ability to use AI effectively. Many who were initially uncertain about AI's role in education gained a clearer understanding of how to use it responsibly and ethically to enhance their writing and data interpretation.

This lesson serves as a model for blending AI and quantitative analysis in doctoral education, ensuring that future educational leaders are equipped with the skills to not only analyze data but also to effectively communicate their findings and implications.