Preparing for ChatGPT: Comparing Student Attitudes on Generative AI in Contrasting Class Instruction

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Introduction

AI text generators have inspired confusion, concern, and curiosity among students and educators, particularly after the release of OpenAI's ChatGPT in November 2022. For educators, two essential questions have arisen: "How can we discourage students from using AI to replace their own critical thinking?" and "How can we support appropriate use that deepens critical thinking?" We hypothesize that students will be less likely to rely too heavily on generative AI to complete their assignments if instructors teach them how to use it effectively and appropriately instead of broadly prohibiting its use. This paper presents the results of a survey on students' perceptions of and experience with Generative AI/ChatGPT. Identical surveys were administered to students in two different sections of the same junior-level writing course for engineering majors. In one section, students were given prior instruction in the focused, ethical use of ChatGPT with a special emphasis on Generative AI's professional impact. These students were then asked to practice prompt engineering using the CLEAR framework described by Lo [1]: Concise, Logical, Explicit, Adaptive, Reflective. In the other section, students were given no specialized instruction in generative AI tools or prompt engineering but were told that any unauthorized use would be considered plagiarism. By comparing the responses of the two groups, we hope to develop a balanced instructional approach, acknowledging that these tools represent a permanent shift in academic and professional communication without losing sight of our fundamental responsibility as educators—to help students hone their critical thinking skills and develop a deep understanding of their discipline.

Generative AI Development and Implications for Education

In the 1960s, MIT professor Joseph Weizenbaum developed ELIZA, an early example of a "chatterbot" (now known as a chatbot). After observing people interacting with the program, Weizenbaum was surprised by the human feelings users attributed to ELIZA, which was merely using pattern matching to create the illusion of understanding. In contrast, today's Generative AI technology uses natural language processing to converse with impressive depth and complexity. Large language models, the deep learning algorithms behind generative writing tools, are trained on massive sets of data. In 2018, when OpenAI released GPT-1, it was trained on data equivalent to 7,000 books, while later versions were trained on 45 terabytes (the equivalent of about 3 million books). GPT-2 and GPT-3 demonstrated capabilities even developers had not anticipated, such as "few-shot learning," the ability to rapidly adapt with limited labeled data [2].

In November 2022, OpenAI released ChatGPT, and its wide exposure brought countless possibilities, questions, and ethical implications. According to a January 2023 Study.com survey [3] of college students, 48% of students admitted to using ChatGPT to help with a take-home test, and 53% had used it to write an essay. Over a third (34%) of instructors believed its use should be completely banned in universities, while 66% said students should be able to use it. Instructors who supported its use cited ChatGPT's ability to support student learning by explaining difficult concepts. At the same time, its potential to help students *avoid* learning is a

significant concern. When ChatGPT was asked to answer questions on the United States Medical Licensing Exam, "'it performed at or near the passing threshold without any training or reinforcement'" [2]. A review of ChatGPT's impact on education [4] highlighted its potential as a "virtual tutor," while acknowledging "the threat it poses to academic integrity" and instances of generating incorrect or entirely fake content. The review recommended that instructors and students understand Generative AI's limitations and how to use it effectively and ethically. The challenge, however, is defining effective and ethical use.

Lo [1] developed the CLEAR Framework for Prompt Engineering to address the need for "a concise and user-friendly method tailored to optimize interactions with generative AI language models, especially for beginners." The focus of this framework is prompt engineering, experimenting with the language of queries for AI language models. Lo refers to this process as "fine tuning" inputs to generate precise, focused responses. The acronym "CLEAR" represents the five principles to use in this fine-tuning process: Concise, Logical, Explicit, Adaptive, and Reflective. Lo asserts that by considering these principles when constructing and revising inputs, users are practicing their critical thinking skills, enhancing their knowledge of the topic, and narrowing the responses. As an example, Lo offers the vague prompt, "What are some ways to conserve water?" and contrasts it with the more precise, "List five household practices for conserving water and their potential impact." By using the direct verb "list," adding a number, and limiting the query to "household practices," the user is putting more thought into their intent and is likely going to get a more focused response.

A Prompt Engineering Activity in a Writing Class

An instructor of Technical Writing, a junior-level writing class required of all engineering undergraduates at Mississippi State University, modified an existing activity to incorporate the CLEAR framework. When the instructors of Technical Writing first learned of ChatGPT, just before the spring 2022 semester, they decided to add a syllabus statement banning its use on writing assignments and warning students that it could be considered plagiarism. However, as the instructors learned more about the applications of generative AI, they realized that banning it was both impractical and unfair to the students, who would undoubtedly use it academically and professionally. Therefore, in fall 2023, they decided to explore ways to incorporate it into class instruction, hoping to create reasonable parameters that would allow students to use it effectively and ethically.

The existing assignment was an infographic activity that had been used for many years in Technical Writing. Prior to this activity, students would write individual papers describing an innovation in their disciplines, targeting a non-expert reader. Teams of 3–5 students would then create a concept for a futuristic city based on all their innovations, designing an infographic in class to advertise their city. Teams were instructed to include a panel on the infographic for each innovation, with each panel containing a brief description of the innovation and an accompanying image.

In one section of the course (Class 2), the instructor kept the assignment the same as it had been and did not allow students to use ChatGPT as they developed their infographic. The instructor

also provided no instruction in using ChatGPT. In another section (Class 1), a different instructor modified the activity to include instruction in ChatGPT and required students to practice the CLEAR Framework for Prompt Engineering. The survey was distributed to both sections two weeks after they had completed the infographic activity. Class 1 (with instruction) comprised 68 students separated in 3 sections of the course. Class 2 (without instruction) comprised 44 students separated in 2 sections of the course.

Instruction in Class 1 began with reviewing the infographic assignment's general goal—to define each technological advancement in the futuristic city in a way that laypersons can clearly understand both a basic definition and a potential impact of the innovation. Afterward, the instructor for Class 1 added the caveat that students should use ChatGPT as a "writing assistant" to help them with various stages of the writing process, from pre-writing and discovery to editing and revising. In this manner, the instructor for Class 1 hoped to familiarize students with the ethical, efficient use of ChatGPT in a low-stakes activity.

Before beginning the activity, students were warned of the potential dangers of ChatGPT, including potential issues with copyright law [5], data security and inaccurate information [6], and inherent racial/cultural biases [7]. After discussing how these potential issues might impact the use of generative AI, students reviewed some of the effective uses of ChatGPT: aiding in pre-writing with quick queries and answers; using ChatGPT as a "writing assistant" for grammar and revision; and analyzing vast amounts of data.

To help mitigate the dangers of AI and maximize the potential benefits, the instructor reviewed the funnel method of AI with a review of Lo's [1] CLEAR framework. Slide 1 below summarizes the instructor's method of using ChatGPT throughout the writing process, starting with a "broad" discovery process and ending with a self-edited, specific document.
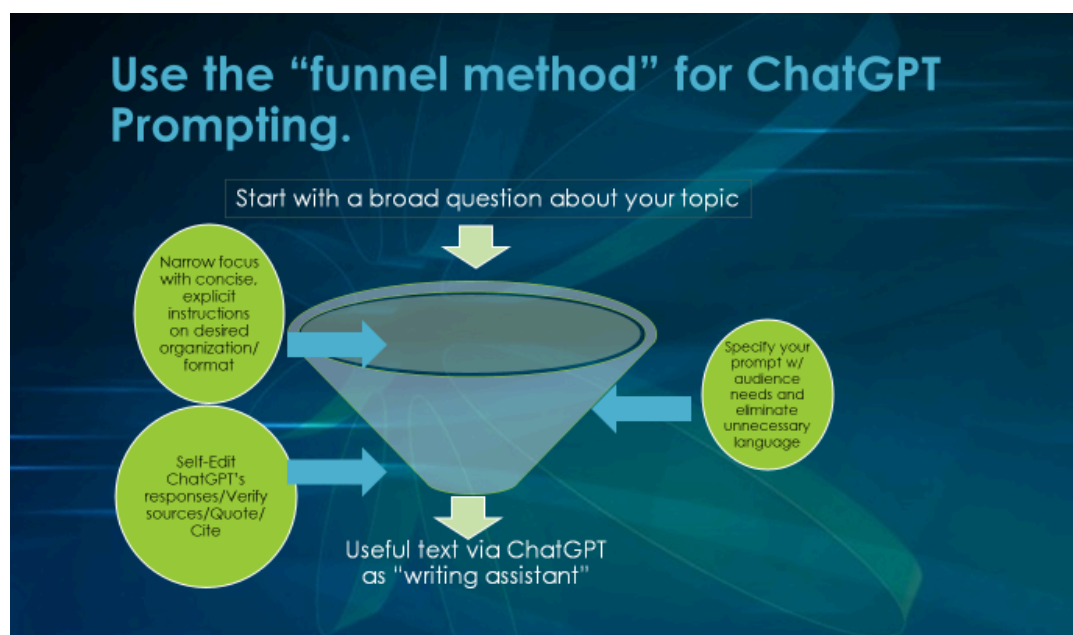
Slide 1: The Funnel Method for Generative AI

Students were taught the funnel method for ChatGPT, starting first with simple research through a broad question on the inputted topic. Afterward, the instructor reviewed how the funnel method utilizes Lo's [4] CLEAR framework to narrow the focus through more specific, logical prompts that explicitly instruct ChatGPT to output the desired organization and format of the document. Students were then instructed how to narrow their scope even further, first by using ChatGPT to adapt to different desired audiences, changing the wording and adapting the information for the layperson. Next, students were taught to self-edit ChatGPT's outputted suggestions to ensure accuracy of the sources and the desired outcome for the assignment. For the infographic assignment, students were instructed to provide a concise definition for the layperson and a clear impact the discussed innovation may have on the general public.

Students were then shown an example of an infographic section that was created using ChatGPT and the funnel method. Slide 2 shows the concise definition and impact statement, thus achieving the desired goals of the infographic assignment.
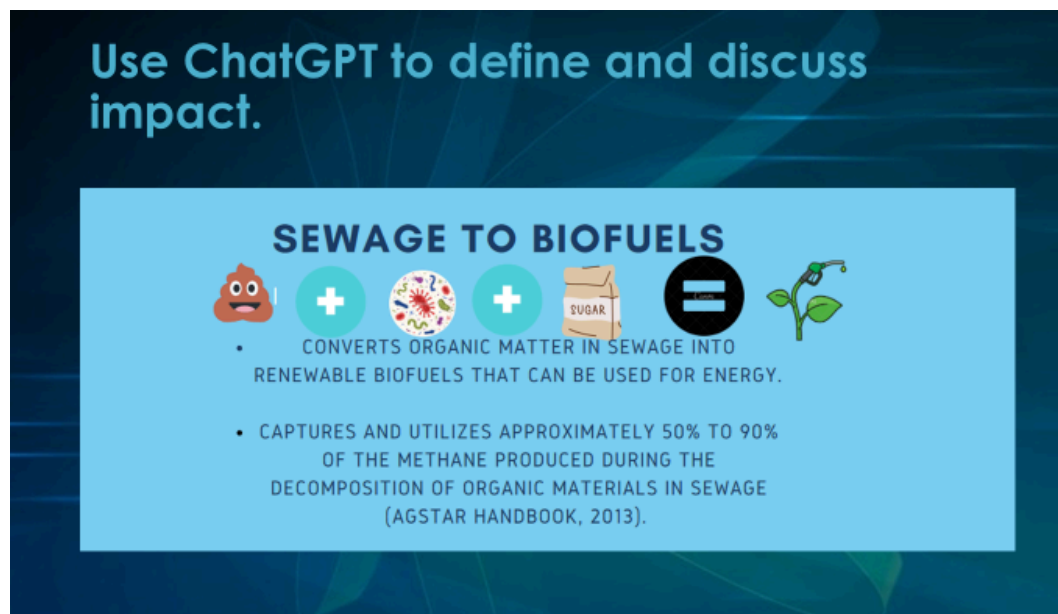
Slide 2: Example of Infographic Using ChatGPT

Here, students saw the results of using ChatGPT; more importantly, however, students were then instructed on the process of how this was achieved. The instructor shared the complete chat and the process leading to the final product. Each of the prompts was entered in ChatGPT in the following order:

1. "What can you tell me about producing sewage to biofuels?"
2. "Define sewage to biofuels in one concise sentence."
3. "Translate for non-experts."
4. "What impact can this process have on the environment?"

5. "How can this process reduce methane pollution? Use a source."

The class reviewed how the prompts started broad, thus receiving broad results. More narrow, logical prompts were then entered, resulting in a more accurate, useful output. Finally, the class was instructed on how the information from ChatGPT was checked for accuracy by the user and cited appropriately.

The class then used ChatGPT to help form their own infographics. Afterward, each group presented their own assignment and discussed their process. Some students started broad and used ChatGPT for pre-writing while others used more narrow, logical prompts from the beginning, using ChatGPT more in the editing and revision process. By reviewing effective uses of ChatGPT throughout the writing process and allowing students to practice with ChatGPT in a classroom setting, the instructor aimed to familiarize students with efficient and ethical uses of generative AI.

Results and Discussion

To compare student perceptions of generative AI in the section with instruction (referred to as Class 1) and without instruction (Class 2), identical surveys were distributed to the students in both sections. Questions addressed students' familiarity and experiences with Generative AI and their opinions about its use in academic and professional settings, as well as its overall risks and benefits. In Class 1, 59 students responded, and in Class 2, 34 students responded to the survey. The responses were anonymous; the instructors only categorized responses by section. Figures 1–6 below show the two sections' responses to the first 6 questions.
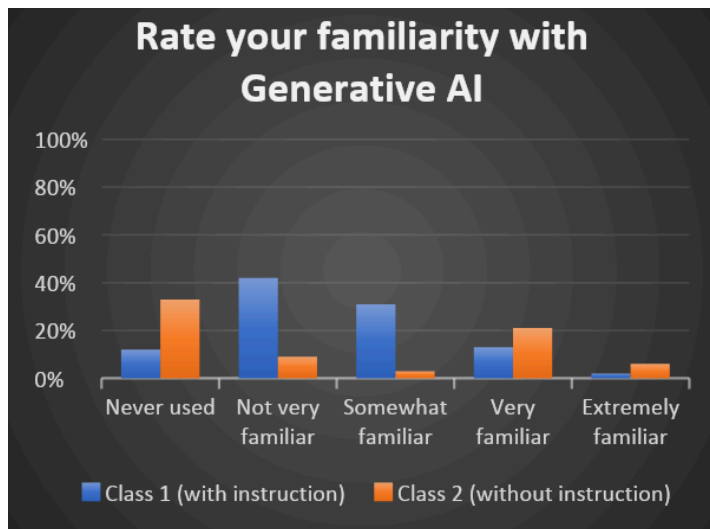

Figure 1. Rate your familiarity with Generative AI

Comparing the two classes' responses, the most significant differences are in the responses "never used" and "not very familiar." In Class 2 (no instruction), over a third of the students chose "never used" (34%), while Class 1's most popular response was "not very familiar" (42%).

Only 16% of the students in Class 1 and 28% of the students in Class 2 rated themselves as "very" or "extremely familiar."
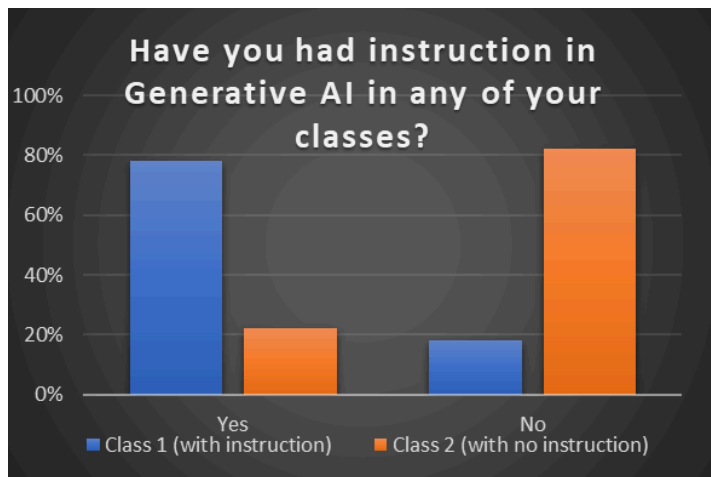

Figure 2. Have you had instruction in Generative AI in any of your classes?

As expected, most of the students in Class 1 (78%) said that they had received instruction in Generative AI. The instructor waited two weeks after the date of instruction to distribute the survey, so some students might have forgotten the instruction, and some might have been absent. In contrast, in Class 2, 82% of the students said they had received no instruction in Generative AI in any of their classes.
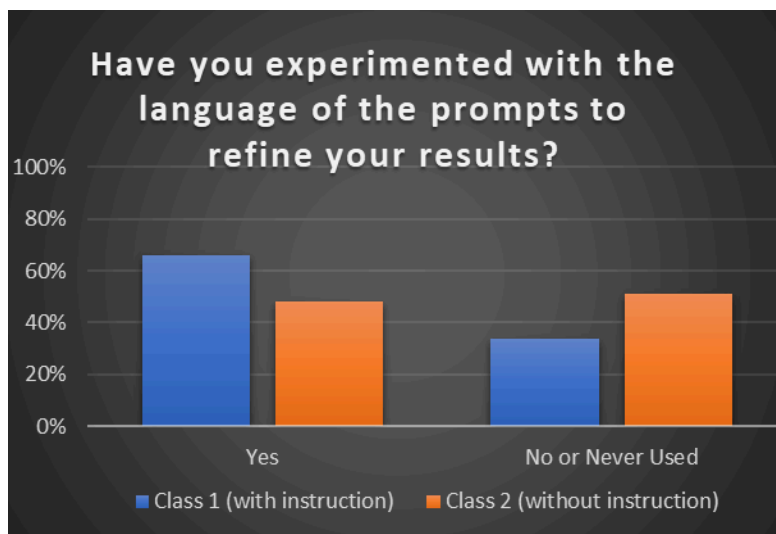

Figure 3. If you have used generative AI, have you experimented with the language of the prompts (such as broad vs. narrow) to refine your results?

As in Question 3, it was expected that most of the students in Class 1 would say they have experimented with constructing prompts, but the two sections' responses were very similar. In Class 1, 66% of students answered yes vs. 50% for Class 2. To account for this response, some

students in Class 1 may have used AI in alternative ways, such as for editing sentences rather than generating material by starting broad and refining results.
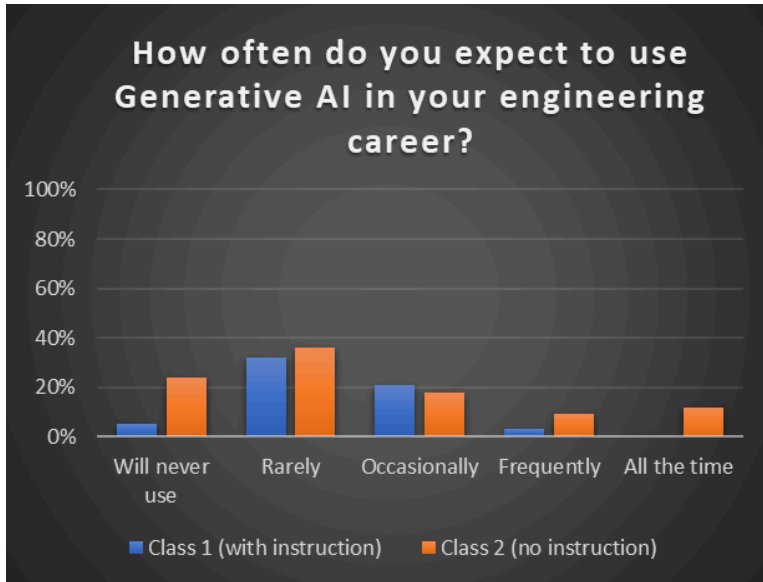

Figure 4. How often do you expect to use Generative AI in your engineering career?

For Question 4, a significant difference between the sections can be seen in the "will never use" response. In Class 2 (no instruction), 25% of students said they would never use Generative AI in the workplace, while only 5% of those in Class 1 chose that response.
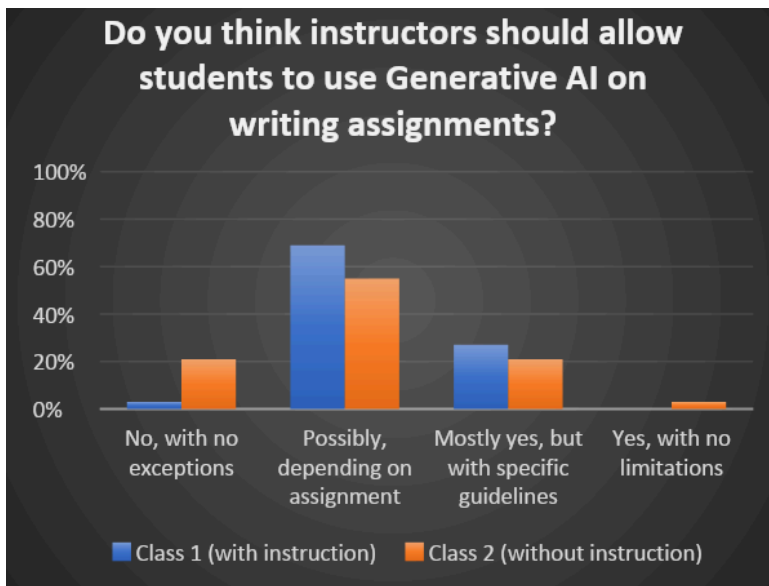

Figure 5. Do you think instructors should allow students to use Generative AI on writing assignments?

Like Question 4, Question 5 focuses on application, but in an academic context. Almost all the students in Class 1 (97%) selected either "possibly" or "mostly yes" when asked if students should be allowed to use Generative AI on writing assignments. It is important to acknowledge that the responses of Class 1 might have been influenced by their instructor's demonstration of ChatGPT as an educational tool. In Class 2, 22% selected "no, with no exceptions." At the other extreme, no students in Class 1 responded "yes, with no limitations," while 13% of those in Class 2 gave that response. In contrast to the polarized yes/no responses of Class 2, the more nuanced responses in Class 1 could suggest that the students have learned that there are different ways to incorporate Generative AI and that their instructors might allow its use in certain circumstances.
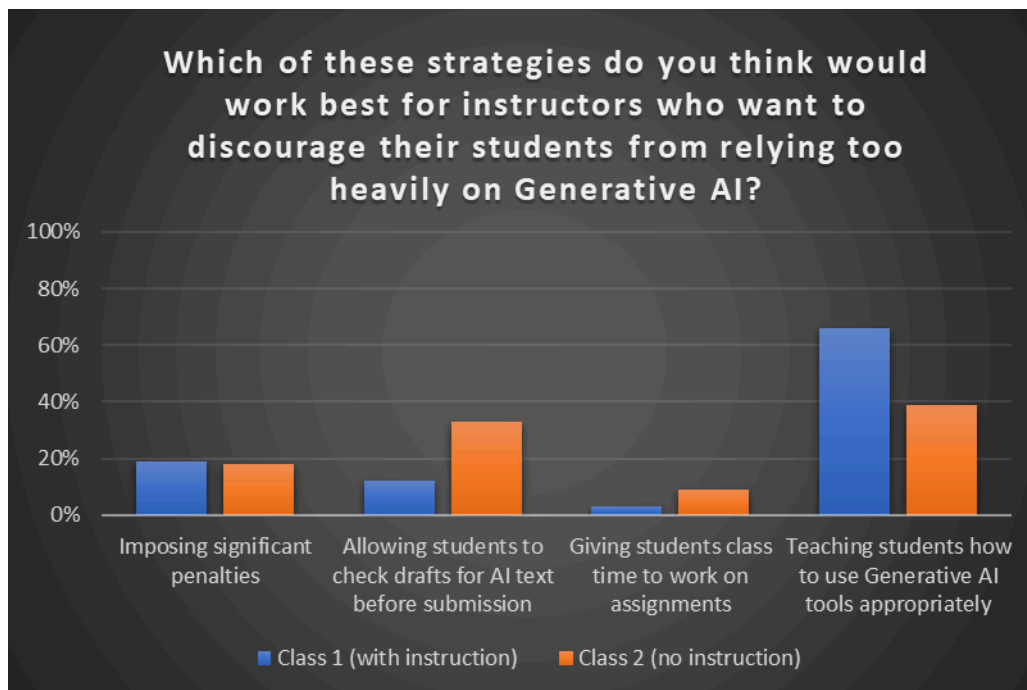

Figure 6. Which of the following strategies do you think would work best for instructors who want to discourage their students from relying too heavily on Generative AI?

Questions 6 and 7 examine academic use of Generative AI in more depth. In Question 6, students were asked to select the most effective strategy instructors could use in deterring overreliance on Generative AI. As with Question 5, these responses suggest more nuance in Class 1's perspective. The most popular response by far in Class 1 was "Teaching students how to use Generative AI tools appropriately" (66%), while 41% of students in Class 2 chose that strategy.

Question 7 presented students with the same strategies as in Question 6 but asked them to rank all four instead of choosing just one. In Class 2 (no instruction), 30% of the students ranked "Teaching students how to use Generative AI tools appropriately" as the least effective strategy, a sharp contrast with only 7% of students in Class 1 who ranked it as the least effective strategy. These differences might indicate that after the activity, more students in Class 1 understood how instruction in Generative AI can help them use it in targeted ways.
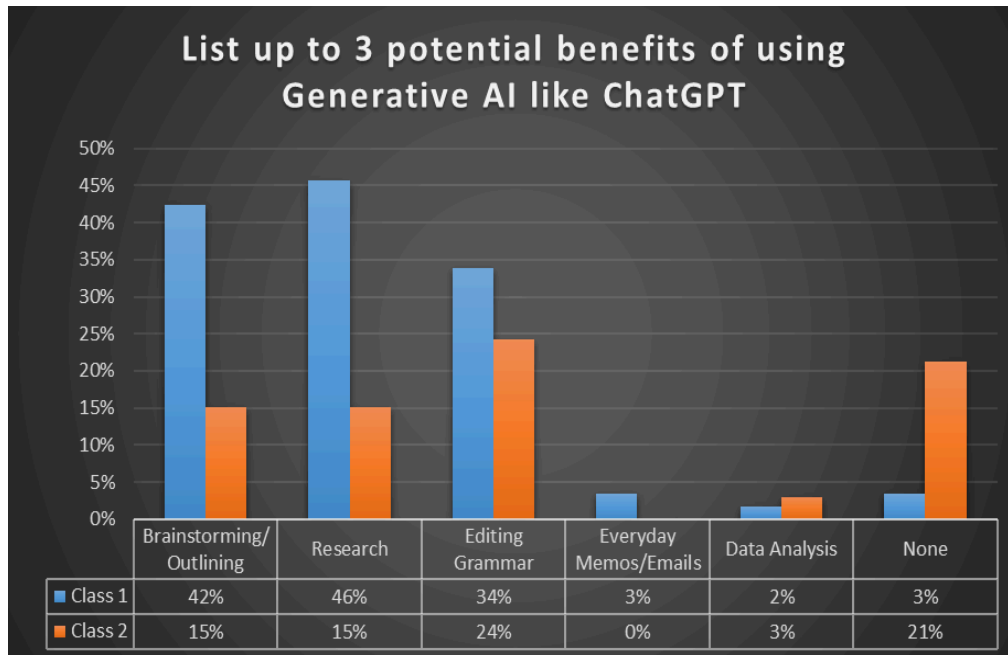
Figure 7. List up to 3 potential benefits of using Generative AI like ChatGPT.

Question 8 asks that students list, without any multiple-choice options, up to 3 benefits of using Generative AI and ChatGPT. Responses varied, so the most popular 6 categories of answers were chosen for analysis: 1) Brainstorming/Outlining 2) Research 3) Editing/Grammar 4) Everyday Memos/Emails 5) Data Analysis 6) None. An interesting trend appears in the "None" category, as students in Class 2 (no instruction) were more likely to claim that Generative AI had no uses in academia or the workplace. Students in Class 1 (with instruction) were more likely to give balanced suggestions for potential use, with the most popular being "Research" at 46% and Brainstorming/Outlining at 42%.
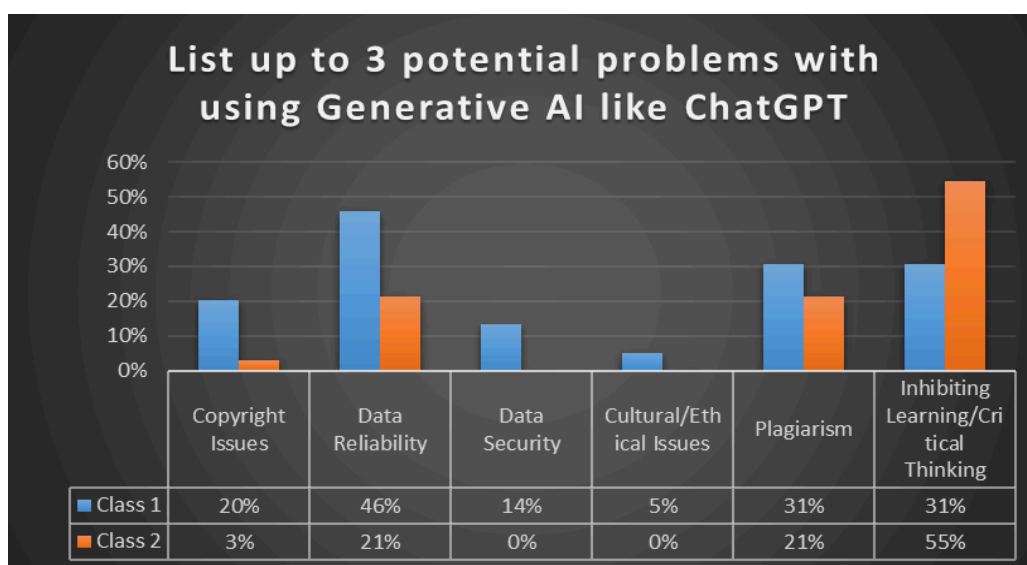

Figure 8. List up to 3 potential problems with using Generative AI like ChaGPT.

Question 9 asks that students list up to 3 potential problems with using Generative AI. Like with question 8, students were not given a bank of answers to choose from and instead came up with their own responses. The most popular 6 responses were chosen for analysis. For Class 2 (no instruction), the most popular response, comprising 55% of students, was that Generative AI would inhibit learning and critical thinking; alternatively, only 31% of students from Class 1 chose "inhibiting learning/critical thinking" as a potential problem. By exploring ChatGPT's legitimate uses and potential problems, the instructor hoped to ease fears about the potential of ChatGPT, enabling students to see it more as a writing assistant rather than something that would completely remove the necessity of critical thinking and the writing process.

The most popular response for Class 1 (with instruction) was potential problems with data reliability. Students in Class 1 (with instruction) were also more likely to identify potential copyright issues as a problem, and 14% of students in Class 1 chose "Data Security" as a potential problem while 0% of students in Class 2 identified this potential issue. This suggests that students in Class 1 have a more nuanced idea of potential problems with ChatGPT, allowing them to navigate these issues and use ChatGPT more effectively.

Conclusions and Future Work

When comparing the responses of the students with instruction (Class 1) and without (Class 2), several trends were noted. First, a minority of students in both classes indicated that they were very familiar with Generative AI, and 82% of students in Class 2 said they had received no instruction on the tools in any of their classes. When students were asked about how they would use Generative AI in academic and professional contexts, Class 1's responses indicated more nuance in their understanding of its applications. When asked about using Generative AI in the workplace, more students in Class 2 said they would either use it all the time or never, while responses in Class 1 were more evenly distributed between "rarely" and "occasionally." Similarly, more students in Class 1 said that "Teaching students how to use Generative AI tools appropriately" would be the best strategy to prevent overuse of these tools on assignments. Overall, instruction in Generative AI seems to help students understand both its value and its limitations, and it is clear that many students are not receiving any classroom instruction.

This survey also revealed some limitations in the instruction on ChatGPT from Class 1. The activity and class discussion spanned two class periods of 1 hour and 15 minutes each, a week of class time, and much of that time was spent with students collaborating and working through the infographic material. However, 22% of Class 1 still chose the option that they had no prior instruction in ChatGPT (see Figure 2). Furthermore, Figure 3 shows how 34% of the surveyed students from Class 1 claimed that they had never experimented with changing their prompts in ChatGPT to refine their results. While Class 2 had a higher percentage of students respond negatively to this question with 50%, the trend is still concerning.

To help students retain information and continue their learning experience with Generative AI, more focused activities need to be spread throughout the semester. Both instructors plan to incorporate in-class activities that require students to use ChatGPT in nuanced, focused tasks, allowing them to see its potential uses and drawbacks throughout the writing process.

Furthermore, it is important that students reflect on this experience. In future semesters, the instructors plan on using reflective prompts to encourage students to actively consider their choices when using Generative AI and consider how it might impact their communication in both academia and industry. The instructors also plan to distribute the same surveys to future students to see how their understanding evolves as they learn more about Generative AI, both on their own and in the classroom.

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