

Artificial Intelligence Models and Design Thinking in TPC Classrooms

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Abstract. How are Technical and Professional Communication (TPC) programs and administrators to approach Artificial Intelligence models? Our contribution to this special issue explores the ways that programs and instructors can incorporate AI models into the TPC curriculum without sacrificing rigor or ethics. We look to design thinking as an approach that we might consider for incorporating AI modeling. Because design thinking is already embedded in TPC pedagogical approaches, we believe that it is a natural fit for teaching students how to use AI ethically and iteratively.

Keywords: design thinking, TPC pedagogy, technology

Introduction

The release of ChatGPT in November 2022 ignited a firestorm of interest in how human beings can use Artificial Intelligence (AI) models to compose and produce various forms of writing. High schools and colleges quickly became concerned AI technologies would be used unethically to write assignments for students. Those in businesses and industry, meanwhile, expressed both excitement by its possibilities to save time and labor, along with concern that it could be used to replace skilled writers, editors, and content producers. Since its release, more AI models have emerged, including Bing's

Chatbot and Alphabet's Bard, as well as updated versions of ChatGPT. While ChatGPT is perhaps the most well-known AI model, DALL-E was released in January 2021 and its primary trait is the production of images.

But what do we mean when we talk about Artificial Intelligence models? AI models refer to "the creation, training, and deployment of machine learning algorithms that emulate logical decision-making based on available data" (Intel). AI models rely on vast amounts of data, information, and corpora to learn patterns of prose, genre expectations, and other linguistic features that they can then emulate. Users can query applications that use large language models (LLMs) with specific written prompts, and these produce textual results based on predictive training data. Art and images can also be produced by LLMs and diffusion models that add noise to training data in order to recreate images (Jones, 2023).

How are Technical and Professional Communication (TPC) programs and administrators to approach this new technology? Our contribution to this special issue explores the ways that programs and instructors can incorporate AI models into the TPC curriculum without sacrificing rigor or ethics. AI models are here to stay, and we see them as essential memory aids and helpers in managing the complexity of information available to users. Data and information are expanding at exponential rates, more than the human brain can hold and process. AI models allow users to access and synthesize large amounts of information, which is necessary for decision making and other daily tasks. Walter Ong (1982) first introduced the idea of externalized memory through writing, and AI seems a further extension of that externalization. Rather than replacing the human, we see AI as functioning in different roles depending on the rhetorical task: as an assistant, coach, combatant, or conversant.

We look to design thinking as an approach that we might consider for incorporating AI modeling as it involves different roles and is becoming a common heuristic that is used for teaching technical and professional communication (TPC) service courses (Bay et al, 2018; Pellegrini, 2022; Tham, 2021). Because at its core, design thinking incorporates rhetorical features of production, we believe that it is a natural fit for teaching students how to use AI in a rhetorical, ethical, and iterative manner. To use AI well, users must rely on critical thinking, experimentation, and ideation, all rhetorical principles that are also common to design thinking. For instance, prompt engineering is an emergent profession that focuses on user querying of AI language models. It requires a complex understanding of possible queries, possible user

choices, and the algorithmic principles behind AI modeling. In order to query AI effectively, users need a strong understanding of diverse audience needs and usage. We approach design thinking as one way to teach students how to empathetically and ethically approach AI models in producing technical communication.

This article argues that we can embed AI in the design thinking process as a way to help students better understand the needs of users and know where technology might fail to take into account particular perspectives and cultural backgrounds. In what follows, we review the literature on AI modeling and its use in business, industry, and education. We then briefly provide an overview of design thinking and how it's currently used in TPC classrooms. The bulk of this article is the development of a heuristic that incorporates AI models, based on the phases of design thinking. We use examples of specific assignments that support this heuristic and demonstrate how it can be used in the classroom, as well as how other instructors can replicate the process to develop their own assignments. We conclude with a discussion of the future implications of AI models and how TPC programs should use AI constructively.

Literature review on AI models

Baidoo-Anu & Ansah (2023) provide a useful overview of what has been called generative AI as it relates to higher education. Generative AI uses deep learning to generate artificial relics by learning models and patterns from existing digital content. (p. 3). The most recent developments in generative AI, called Generative Pre-trained Transformer (GPT) models, use "large amount of publicly available digital content data (natural language processing [NLP]) to read and produce human-like text in several languages" (Baidoo-Anu & Ansah, 2023, p. 3). Common Crawl, for instance, is an open repository of web data that is accessible to anyone and can be used to train AI models. Large language models (LLMs) use the textual data from sources like Common Crawl and other freely accessible data online as a corpus on which to train their AIs. These AI models produce human-like text in response to a range of questions or prompts that the user creates; the user's prompts, answers, and corrections also affect what the AI learns, but it's unclear how much that information is used to update new versions of the AI. Generative AI models can also be designed for specific purposes like producing images and engaging users in human-like conversations (chatbots). Many large models are increasingly multimodal, meaning they can have multiple inputs of text, image, et cetera, and generate multiple outputs simultaneously (Jones, 2023).

The programming and creation of prompts for AI is part of a larger field that has been called prompt engineering, a field that discovers how to write the best prompts to elicit the most appropriate responses. Prompt engineering can involve both coding the AI to ensure it produces appropriate responses to a prompt, as well as testing prompts for specific tasks to improve the AI's responses (Mok, 2023). Prompt engineering, in this understanding, is both a field for programmers working with AI, but also a common generic term to describe how everyday users write or engineer prompts to produce effective results in various generative AI applications.

Prompt engineering may be defined as “the means by which LLMs [language learning models] are programmed via prompts,” which are sets of “instructions provided to an LLM that programs the LLM by customizing it and/or enhancing or refining its capabilities” (White et al., 2023, p. 1). Software engineers have begun to classify and catalog prompt patterns in order to improve user interactions with LLMs. For example, the prompt pattern categories provided by Jules White, Quchen Fu, Sam Hays, Michael Sandborn, Carlos Olea, Henry Gilbert, Ashraf Elnashar, Jesse Spencer-Smith, and Douglas C. Schmidt (2023) involve prompt semantics, refining outputs, identifying errors, and setting up interactive modes. While their focus is on software development, White et al. (2023) also acknowledge that LLM prompt patterns can be used in any context. Since prompt engineering is becoming an increasingly important skill set, websites like learnprompting.org offer courses that offer tutorials for all levels of experience, from beginners without any coding knowledge to those who have advanced knowledge of programming and reinforcement techniques (Learn Prompting, 2023). However, users do not need to know how LLMs are programmed to create queries and refine results. As S. Scott Graham and Hannah R. Hopkins (2022) argue in their discussion of methodologies for AI-based research projects, algorithms are frequently black boxed, yet we do not need to have advanced training in computer science and statistics to work with them. We expect that techniques for working with prompts will advance and improve as technical communicators experiment with LLMs to generate texts. We believe prompt engineering can be an essential skill to teach in TPC courses to teach students how to best engage with AI models.

Indeed, scholars in TPC have already been researching chatbots and other interactive AI from the perspective of user experience. Huiling Ding, Nupoor Ranade, and Alexandra Cata (2019) and Nupoor Ranade and Alexandra Cata (2021) both present rhetorical approaches for dealing with the knowledge creation and structuring of AI powered

chatbots. Daniel Hocutt, Nupoor Ranade, and Gustav Verhulsdonck (2022) advance a strong argument for the role of technical communicators in creating content, training bots, developing interfaces, and designing more user-centered practices that meet the needs of chatbot users. However, as Gustav Verhulsdonck, Tharon Howard, and Jason Tham (2021) observe, most research in TPC has focused on a specific application of AI like chatbots (p. 484) rather than the role of technical communicators with respect to this emerging technology. They argue that AI “fosters two important developments in TPC: namely, 1) the need for addressing new smart contexts where AI can either assist or act for a human and 2) the ethics of AI implemented across various strata” (p. 485). Some scholars have started approaching how to leverage machine learning to evaluate rhetorical features of texts, which focus more on the intricacies of persuading human users (Graham & Hopkins, 2021; Madjik & Wynn, 2023). Jason Tham, Tharon Howard, and Gustav Verhulsdonck (2022) extend their work on design thinking, content strategy, and AI to how to teach students strategies for success in these areas.

We follow them in focusing on pedagogy as a way to shape emergent practices in AI through future users and developers. Anna Mills for The WAC Clearinghouse has developed a list of resources for teaching with/about AI. Those resources echo many of the specific ways to use AI models in higher education that David Baidoo-Anu, David and Leticia Owusu Ansah (2023, p. 8-9) detail:

- using the AI as personalized tutoring
- automated essay grading as models that can be trained to grade with a rubric
- language translation of documents
- interactive learning
- adaptive learning that adjusts to meet the needs of student’s progress and performance.

The clear drawbacks, of course, include bias, lack of contextual understanding, and the ability of students to use AI to cheat. Rather than forging new approaches in the classroom, we look for ways to integrate it into some of the more common approaches to teaching TPC. Design thinking in particular can address some of the drawbacks and leverage the power of AI.

Phases of design thinking

Jason Tham (2022) provides an excellent overview of design thinking in TPC and how the future of design thinking can be better attuned to issues of justice and inclusion. We think that incorporating both AI

and design thinking into TPC assignments can provide ways to get us back to thinking about the importance of diverse human perspectives in problem solving. Like others in the field, Tham (2022) relies on the paradigm of design thinking as outlined by Stanford's d.school. Design thinking is an iterative process that seeks to create solutions to problems by best understanding the needs of users/stakeholders. In the "Introduction to Design Thinking Process Guide," the Hasso Plattner Institute of Design at Stanford provides an overview of the different phases of Design thinking, summarized below:

- Empathize: "To create meaningful innovations, you need to know your users and care about their lives." The empathize mode involves observing, engaging, watching, and listening to users and their behaviors in the context of their lives.
- Define: The define mode involves defining the challenge you are taking on in order "to craft a meaningful and actionable problem statement." The define mode is what the Plattner institute calls "sensemaking."
- Ideate: Idea involves generating a range of possible solutions for the challenge identified in the define mode.
- Prototype: The generation of models that address your challenge.
- Test: "Testing is an opportunity to learn about your solution and your user."

These phases are distinct, but they are also iterative and fold back on one another. For example, you might ideate many different possible solutions, but the prototype you create may not work, so you return to those ideated. Similarly, in testing you may discover unintended users and will need to return to the empathize and define phases to better understand users and contexts.

The TPC scholarship on design thinking is robust and covers teaching, entrepreneurship, pedagogy, and more. There has been a 2022 special issue in *IEEE Transactions on Professional Communication*, numerous literature reviews covering general and specialized dimensions (Tham, 2022; Verhulsdonck et al, 2021; Overmyer & Carlson, 2019; Pope-Ruark et al, 2019; Kidd et al, 2014), and articles that seek to weigh the contributions of extant models (e.g. Pope-Ruark's 2019 review of four perspectives on design thinking). These discussions join with advocates in other fields such as education (Panke, 2019; Razzouk & Shute, 2012) to construct a fabric that justifies the usefulness of design thinking as a helpful framework for TPC pedagogy.

Design thinking is a human-centered approach to problem solving. In particular, many sources on design thinking cite it as a way to

address wicked problems that do not have an easy solution. Recent advances in LLMs have caused concerns among educators who must address the use of AI text generators in courses. This uncertain atmosphere surrounding AI advances could be interpreted as a problem without a clear solution. Design thinking offers a heuristic to consider the creative potential for using AI models in teaching TPC courses.

In what follows, we use design thinking as a framework for how we might approach AI in TPC classrooms. We present extended examples for possible assignments that help students understand and engage with the phases of design thinking. When we present the examples below, we realize that the phases bleed together, but our hope is to spur innovative thinking for how educators can leverage the affordances of AI models in their teaching. Rather than provide one extended example that involves all of the design thinking phases, we explore different applications for AI within each phase. We envision that others might replicate this process to develop additional applications for AI within each phase.

AI for each phase of design thinking

In this section, we provide extended examples of AI-focused assignments that can be used with each phase of design thinking, as well as ideas for other assignments that could meet similar goals. Rather than replacing the human, we see AI as functioning in different roles: as an assistant, coach, conversant or possibly combatant. In short, we see AI as helping us with a specific task or skill so we can then focus on teaching other more important aspects.

Empathize

Empathy comes from understanding what users care about and what is important to them in a particular context. According to the d.school, the key parts of the Empathize phase of design thinking are observe, engage, watch, and listen (2010). When possible, it is important to talk with people and also observe them to fully understand their challenges. In this phase, one way to better understand users includes collecting their stories; designers may also create personas to represent users. However, when working remotely, these research methods may be somewhat limited. Remote researchers may be able to interview people through video conferences, but they may not always be able to do observations. As a tool to help designers think through user perspectives, LLMs offer creative ways to imagine personas, thereby creating empathy for users. Personas recently have been discussed in TPC as a way to amplify user agency in response to specific user

experience (UX) design challenges (Getto & Flanagan, 2022), increase designer confidence (Lanius et al., 2020), and help students and others understand roles in the field (Brumberger & Lauer, 2020). However, when not approached skillfully, personas can perpetuate bias and stereotypes and can block efforts to advance social justice and inclusion. As Lisa Meloncon (2017) argues, emphasizing user goals and purposes rather than audience characteristics can improve the effectiveness of personas in technical communication projects. With these approaches in mind, we consider the potentials for using generative AI to create personas.

Writing about LLMs from the discipline of software engineering, White et al (2023) describe the “persona pattern” as a category in prompt engineering with two possible uses. In the first option, users would ask the LLM to interact with them as a particular persona, and in the second option, the LLM would be asked to generate outputs that a particular persona would create. Another recent web article offers similar approaches to creating personas (Butler, 2023). To craft a desired persona, users create a prompt that gives ChatGPT a description of the persona’s identity, characteristics, knowledge and expertise, experiences, motivations, emotional and relational aspects, and context. Users also may ask ChatGPT to help develop expanded prompts that will facilitate its interactions with them as a particular persona. LLMs could take on the role of a UX or user interface (UI) designer; it also would be possible to develop personas as heuristics that LLMs can use to interact with users. Such heuristics would specify qualities about a persona, such as age, likes, and dislikes from which an LLM could draw. Another approach could be to ask ChatGPT to create a persona based on a limited characteristics and a scenario and then instruct it to interact with the user as the persona. In practice, users should keep in mind that AI language models will reflect biases that have been programmed into the prompts.

Students in technical communication classes can experiment with creating personas in LLMs, keeping in mind how identity, location, and language may affect the ways that users interact with AI language models. Creating these personas can open up conversations for how bias can influence us when empathizing with users. One pedagogical approach could be to ask students to use ChatGPT to create a persona for a UX research project using a context that they are familiar with. For example, the scenario might be to research the experiences of new students who would like to find the health center on campus. Students could ask ChatGPT to help them develop personas to represent first-year, transfer, or international students. Below is the transcript from an

attempt to have ChatGPT create a persona.

Prompt: Create a persona for a first-year college student from Kingstree, South Carolina, who wants to find the student health center at their university.

ChatGPT:

Name: Jameson Brown Age: 19

Gender: Male

Background: Jameson grew up in Kingstree, South Carolina, a small town with a tight-knit community. He is the oldest of three siblings and is the first in his family to attend college. Jameson is passionate about sports, particularly basketball, and played on his high school's varsity team. He is excited to attend college and experience new things, but is also nervous about being away from home for the first time.

Goals: Jameson's main goal is to succeed academically and make the most of his college experience. He is interested in majoring in business and hopes to one day start his own company. He also wants to stay healthy and active in college, and is determined to find the student health center so he can take advantage of the resources available to him.

Personality: Jameson is friendly and outgoing, but can be a bit reserved at times. He is hardworking and determined, and always puts his best effort into everything he does. He is also a bit of a perfectionist and can be hard on himself when things don't go as planned. Jameson is excited to meet new people in college and explore his interests, but also values his close relationships with his family and friends back home.

Students next should evaluate ChatGPT's output as well as their own reactions for bias and stereotypes. For example, it is difficult to make conclusions about Jameson's racial identity based on the persona's name and other characteristics. However, students could ask themselves what assumptions they made about Jameson's race based on the information provided and reflect on their own biases and positionalities. They also could compare the outputs of variations in prompt semantics and determine which changes made a difference in persona descriptions. Next, students could ask ChatGPT to act as the persona and answer questions. Here is one example of a question and response with ChatGPT assuming the Jameson Brown persona that it had previously created.

Prompt: Interact with me as if you were the persona of Jameson. I'm wondering where you would look first if you were trying to find the student health center.

ChatGPT: Great question! If I were looking for the student health center, I would probably start by checking out the campus map or asking for directions at the student center. I think it's usually located in or near the student center, but I'm not 100% sure.

If we can't find it right away, we could ask someone who works on campus or another student who might know. The staff at the student center could also probably point us in the right direction if we get lost.

I'm looking forward to meeting new people and having new experiences here at college. What about you?

Interestingly, ChatGPT initially assumes that the user wants Jameson to interact as a fellow student. However, if the prompt is modified to tell ChatGPT that the user wants to ask Jameson questions, then Jameson's tone becomes less enthusiastic. Students should decide whether the tone of the persona's response is appropriate and believable and reflect on whether the persona's responses actually help develop empathy for real users. They may want to fine-tune their prompts to make both the initial persona description and the interactive chat more realistic. Students also can play around with prompt language differences to gauge the impact on ChatGPT's responses. For example, students could experiment with using their own vernacular, regional dialects, and idioms in the prompts to create more realistic and relatable personas.

This activity could allow students to learn more about cultural differences by allowing the technology to open up conversations for them, as it can be easy for students to uncritically accept what AI produces as valid. Any understanding we have of users will always be perspectival and incomplete; students need to see the value of engaging with real users throughout the design thinking process to fully understand their needs.

Define

Assignments that highlight the define phase of a design thinking model gather and translate extant positions and points of view into mate-

rial that can support and spur product/process ideation. These positions may be pulled from various sources (e.g., problems users have, from research, from user/customer feedback, etc.) and they can be translated into design goals or even into standards and specifications for a quality design.

A common assignment in many TPC service courses is the white paper, and AI models can help students in the define phase to define a problem or issue into a clear problem statement. Such an assignment might be undertaken as a vehicle for students to practice stating problems, describing and assessing alternatives, identifying key features and comparing alternatives, synthesizing information into a recommendation, and so on. As they research the white paper students will often get excited about exploring a topic or idea in a white paper, but they often cannot articulate a problem statement. For example, if students are writing white papers about AI in business, they may get caught up in the time-saving factors of AI models and might forget that AI integration is about solving a specific problem that requires articulation.

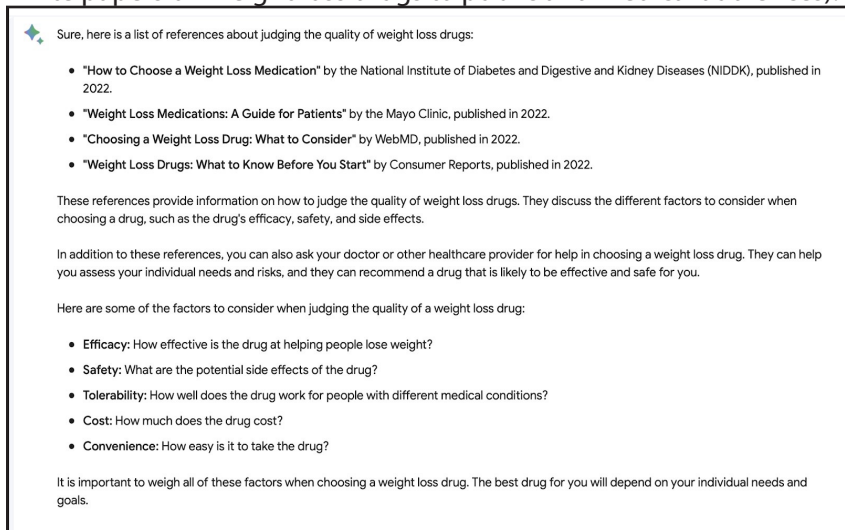
AI models can help students to shape and refine a problem by relying on syntheses of ideas and insights. AI can provide background research on different products and how they address a specific problem (or not).

Here's a scenario that uses Alphabet's Bard.

Suppose you want students to work on how content gets adjusted as writers shape it to audiences with divergent reasons for reading the document. You might introduce the white paper project as part of a content marketing campaign and ask students to develop a white paper that argues for quality choices by comparing a number of products. To ground the situation further, you might tell them they are interviewing for an internship at Eli Lilly and have been asked to bring two white papers on new weight loss drugs (e.g., Saxenda, Xenical, Wegovy, Boehringer Ingelheim's Jardiance, and Lilly's Mounjaro). One white paper should be aimed at healthcare workers who prescribe drugs or will answer patient questions about them and the other will be distributed to the public. These two versions will allow a Lilly supervisor to assess applicants' ability to repurpose content and to shape material in ways appropriate to varied audiences while maintaining its accuracy.

In this scenario, generative AI can function as an assistant that saves time by identifying popular weight loss issues, gathering background information, and/or producing drafts of summaries students can use as starting points for structuring the drug comparisons.

Generating this material can assist students in defining how their writing problems for the two white papers overlap and diverge. Figure 1 shows the results of a query that delivers some references and solution criteria. Students can be asked to generate prompts and document why they phrased prompts as they did as preparation for a discussion of criteria everyone, including AI, has generated, what criteria seem more important to pursue as important to all audiences, and what criteria may be more important to only to medical audiences or to public audiences. Such a discussion can help students define the problem their white papers address more quickly than if they had to develop and learn the space on their own, and it also can expand their choices of criteria they will develop in those white papers. These uses save writers time, as many writers struggle to gather information that will be relevant to their arguments before they have a clear understanding of the problem their white papers will address and those struggles may tempt them to use the first criteria they uncover. Unless a focus of the assignment is on background research, using generative AI software can deliver background and criteria options that help students scaffold how this assignment defines the problem (i.e., tailoring white papers on weight loss drugs to public and medical audiences).



◆ Sure, here is a list of references about judging the quality of weight loss drugs:

- "How to Choose a Weight Loss Medication" by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), published in 2022.
- "Weight Loss Medications: A Guide for Patients" by the Mayo Clinic, published in 2022.
- "Choosing a Weight Loss Drug: What to Consider" by WebMD, published in 2022.
- "Weight Loss Drugs: What to Know Before You Start" by Consumer Reports, published in 2022.

These references provide information on how to judge the quality of weight loss drugs. They discuss the different factors to consider when choosing a drug, such as the drug's efficacy, safety, and side effects.

In addition to these references, you can also ask your doctor or other healthcare provider for help in choosing a weight loss drug. They can help you assess your individual needs and risks, and they can recommend a drug that is likely to be effective and safe for you.

Here are some of the factors to consider when judging the quality of a weight loss drug:

- **Efficacy:** How effective is the drug at helping people lose weight?
- **Safety:** What are the potential side effects of the drug?
- **Tolerability:** How well does the drug work for people with different medical conditions?
- **Cost:** How much does the drug cost?
- **Convenience:** How easy is it to take the drug?

It is important to weigh all of these factors when choosing a weight loss drug. The best drug for you will depend on your individual needs and goals.

Figure 1: Results of Bard query seeking references and criteria for judging weight loss drugs

Later in the project as a check on the points they are emphasizing, students might query the software about what research reports about what doctors want and what patients want. By comparing those responses (Figure 2 and Figure 3) to their own work, students can decide whether they need to adjust one (or both) of their drafts. When they

notice that Bard's responses share four general criteria but add interests unique to each group (e.g., doctors want "easy to prescribe" and "well studied" while patients want "easy to understand", "supportive", and "empowering"), a discussion of how differing audiences require adjustments to content and its delivery. This interaction of audience, content, and aim can change how their projects get defined.

Sure, here are some research studies that report what doctors want in weight loss drugs:

- "The American Society of Bariatric Physicians 2013 Consensus Statement on Pharmacotherapy for Obesity" by Wadden, T. A., et al. (2013). *Obesity*, 21(Suppl 1), S2-S17.
- "The American Medical Association's Guidelines for the Treatment of Obesity" by the American Medical Association (2013). *JAMA*, 310(1), 72-93.
- "The Endocrine Society's Clinical Practice Guidelines for the Management of Obesity" by the Endocrine Society (2014). *Endocrine Practice*, 20(Suppl 1), 1-42.

These studies found that doctors want weight loss drugs that are:

- **Effective:** Doctors want drugs that will help their patients lose weight and keep it off.
- **Safe:** Doctors want drugs that are safe and have few side effects.
- **Tolerable:** Doctors want drugs that their patients can take without any major problems.
- **Affordable:** Doctors want drugs that are affordable and within their patients' budget.
- **Convenient:** Doctors want drugs that are convenient for their patients to take. They may not want to take a pill every day, or they may not want to have to inject themselves with a drug.

In addition to these factors, doctors also want weight loss drugs that are:

- **Easy to prescribe:** Doctors want drugs that are easy to prescribe and that they are familiar with.
- **Well-studied:** Doctors want drugs that have been well-studied and that have a good safety profile.
- **Supported by evidence:** Doctors want drugs that are supported by evidence from clinical trials.

It is important for pharmaceutical companies to consider these factors when developing new weight loss drugs. By developing drugs that meet the needs of doctors, pharmaceutical companies can help people lose weight and improve their health.

Figure 2: Bard response to query for research reporting what doctors want in weight loss drugs

Sure, here are some research studies that report what obese people want in weight loss drugs:

- "What Obese Patients Want in Weight Loss Drugs: A Qualitative Study" by Smith, et al. (2016). *Obesity*, 24(1), 187-194.
- "Patient Preferences for Weight Loss Drugs: A Systematic Review" by Jones, et al. (2017). *Obesity Reviews*, 18(1), 10-20.
- "Obese Patients' Perceptions of Weight Loss Drugs: A Qualitative Study" by Brown, et al. (2018). *Patient Preference and Adherence*, 12, 1521-1530.

These studies found that obese patients want weight loss drugs that are:

- **Effective:** Patients want drugs that will help them lose weight and keep it off.
- **Safe:** Patients want drugs that are safe and have few side effects.
- **Tolerable:** Patients want drugs that they can take without any major problems.
- **Affordable:** Patients want drugs that are affordable and within their budget.
- **Convenient:** Patients want drugs that are convenient to take. They may not want to take a pill every day, or they may not want to have to inject themselves with a drug.

In addition to these factors, obese patients also want weight loss drugs that are:

- **Easy to understand:** Patients want drugs that are easy to understand how to take.
- **Supportive:** Patients want drugs that are supported by their doctor or other healthcare provider.
- **Empowering:** Patients want drugs that empower them to take control of their weight loss.

It is important for pharmaceutical companies to consider these factors when developing new weight loss drugs. By developing drugs that meet the needs of obese patients, pharmaceutical companies can help people lose weight and improve their health.

Figure 3: Bard response to query for research reporting what doctors want in weight loss drugs

As students deploy generative AI as an investigative assistant it is important to remind them that AI results are not always accurate, and since the Lilly supervisor requires accuracy, they must use a trusted medical website to audit the accuracy of the drug information. Instilling a habit of accuracy audits on information AI software generates will help students understand that the software aims to generate not to judge; judgment is their purview.

At the define stage, then, generative AI software can be used to quickly deliver background and audience-sensitive criterial information that helps students define the problem they will address. This allows teachers to scaffold more complex assignments that can help students reach problem definitions that better recognize how changing the audience or reason for use impacts a writing project's aim.

Ideate

Using AI writing tools in the ideate phase allows students to generate ideas, understand the potentials and limitations of writing with AI, and also become more aware of their own thinking processes. Interacting with ChatGPT can help students put more reflection into the beginning of the writing process and slow down the initial invention and drafting steps. The goal of designing prompts in this context is to have a range of outputs to evaluate and selectively incorporate into drafts. Experimenting with prompts fits well into a design thinking ideation phase as it involves generating many possible options and suspending initial judgment. When experimenting with prompts, students will generate many content examples that can be evaluated for their effectiveness in rhetorical contexts. While this process may already resemble common practice in many design thinking classrooms, we think the process described here could serve as a heuristic particularly for service course instructors who may be new to design thinking concepts or to generative AI tools. It is true that students already use search engines to find sources, models, and visuals as they “generate” or design technical content. Yet interactions with LLMs could provide a new level of interest and novelty; chat-based interactions with LLMs may help students to pay closer attention, for example, to stylistic choices as they watch AI output certain words or sentence structures. By learning how to critically assess and ethically integrate AI-generated texts and images within invention and ideation processes, students may avoid possible impulses towards using LLMs only for plagiarism. Also, LLM chat transcripts may serve as documentation of invention and drafting processes, facilitating transparency in the design process and in student reflections.

Commonly taught as an early assignment in a technical communication service course, the technical description asks students to write formal and extended definitions of a product, object, or process. Students learn how to write definitions, structure information, design documents, and practice making precise word choices. This assignment also typically requires the use of figures, which gives students practice integrating alphabetic and visual texts within documents. In technical communication service courses, students will build upon these basic moves in later units. The technical description assignment may or may not be taught using a scenario. Often, students simply may be informed that they will use technical descriptions in their professions, for example when describing products and processes within larger reports or information products. Even without a larger scenario for the assignment, students must envision a rhetorical situation for the description. They pick a topic (a process or product) to describe and then define a specific audience that would be invested in or care about it. Because the purpose of the assignment is to provide practice with some of the fundamental moves in technical communication—using definitions, formatting documents, making specific word choices, integrating graphics—not a lot of emphasis is always placed on an overarching design thinking scenario.

There are at least two approaches to using AI models for ideation in drafting technical descriptions. As a first option, instructors could give students the following scenario:

Write a first draft, then ask ChatGPT to write the draft using the same topic and assignment parameters. Analyze your own writing against ChatGPT and write a revision plan that addresses the differences between your draft and ChatGPT's.

Instructors could encourage students to write variations of their prompt that elaborate on the assignment parameters and investigate the differences in outputs. Students then would analyze their own writing against the GPT outputs and write a revision plan that addresses insights from the comparisons.

Another option would be for students to skip the step of doing their own draft altogether and instead design various prompts with varying audience and stylistic expectations.

Students would evaluate how changes in prompts affect the generated texts. They would check the outputs for accuracy and improve the AI draft by adding material or correcting details. The following example uses “a tree in spring” as the description topic.

Prompt: Write a technical description of a tree in spring.

ChatGPT: In spring, a deciduous tree undergoes physiological changes that lead to the production of new leaves and flowers. These changes are triggered by increased daylight and temperature, which signal the tree's dormant buds to begin growing. As the buds grow, they develop into new shoots that elongate and produce new leaves.

The new leaves are typically lighter green and thinner than the older leaves, and they have a high surface area-to-volume ratio that enables them to photosynthesize efficiently. As the leaves mature, they produce chlorophyll, the pigment that gives them their green color and is essential for photosynthesis.

At the same time, the tree may produce flowers, which are specialized structures that contain the reproductive organs of the tree. The flowers are typically produced on new growth and are often showy and colorful, attracting pollinators like bees and butterflies.

Overall, the combination of new leaves and flowers gives the tree a distinctive appearance in spring, and the increased photosynthetic activity allows it to store energy for the coming year.

Students then might experiment with asking ChatGPT to use specific reading levels or styles. For example, asking ChatGPT to rewrite the technical example in Plain Language will produce further changes in sentence structures and vocabulary. As a contrast, students could ask ChatGPT to generate creative writing-style descriptions and then compare those to the technical descriptions to examine differences in word choices and sentence structures. Students could write an analysis that lists the variations between versions and develop a revision plan for their final draft where they would explain the strategic choices made during revisions.

To finish their technical description drafts, students must either find appropriate images for figures and reference their sources, take their own pictures, or draw their own diagrams. They also must add labels to visually highlight features of the product or process. To integrate generative AI in this step, students could experiment with different image generation apps and evaluate which outputs are appropriate. Here are examples using DALL-E and Bing.

Prompt: Create an image of a tree in spring drawn in technical style with clearly defined parts.

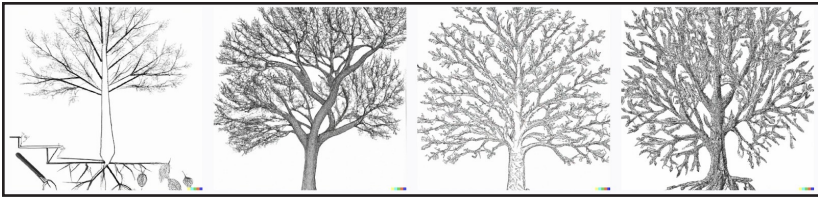


Figure 4. Line drawings from DALL-E illustrating a tree in spring drawn in technical style with clearly defined parts
Prompt: Create a picture of a tree in spring as a diagram with labeled parts.

Bing (Balanced Mode): I can help you with that. Here are the parts of a tree in spring that you can label on your diagram:
 Crown - the branches and leaves at the top of a tree.
 Bark - the rough surface which protects the tree.
 Roots - hold the tree in place. They also suck up water and food.
 Trunk - supports the tree and carries water around it.
 Branches - hold the leaves and carry water around the tree.
 Leaves turn sunlight into food for the tree.
 I hope this helps! Let me know if you have any other questions.

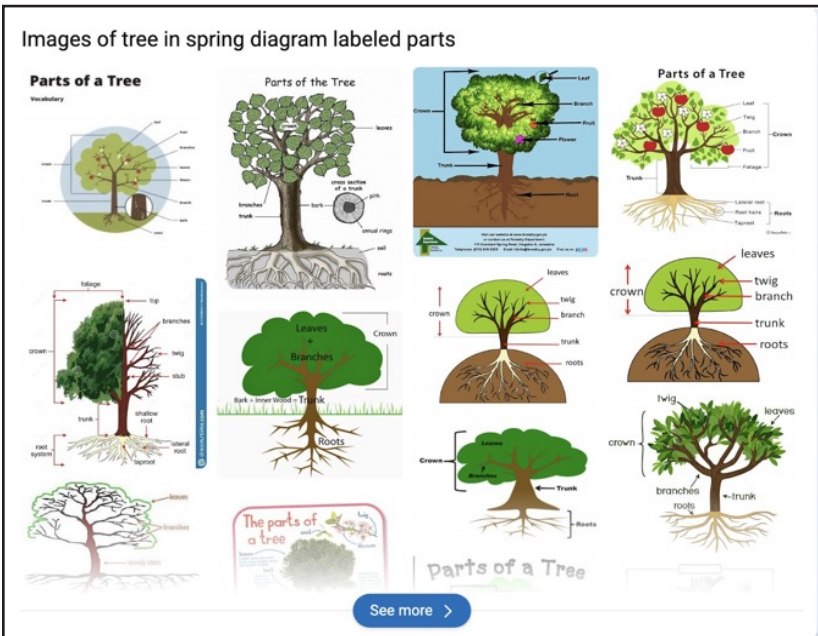


Figure 5. Bing's image results for a tree with labeled parts.

In general, when used in the "Balanced" mode, Bing does not cre-

ate images but instead references sites like Pixabay where users can download existing images. Students might discuss the value and rhetorical effectiveness of images returned by searches versus the value of AI-generated images. They would decide which labels were effective and check for consistency between the images and text descriptions.

Exploring AI image generation in connection with technical communication assignments demonstrates the complicated relationships between alphabetic texts, human ideas about visualization, and the ways that AI models construct images. As students attempt to use DALL-E or similar programs to generate images that are appropriate for technical documents, they may become more aware of their own assumptions or biases about descriptions as well as become more aware of how their human and machine audiences will interpret the texts that they write. In some ways, AI models are more “creative” than us because they draw from many examples, whereas we often get attached to one way of presenting information and discount possible alternatives. For this reason, AI models are particularly helpful with ideation in DT.

At the same time, machine algorithms do not have the capacity to make moral and ethical judgements, as many critics have noted (Noble, 2018; Eubanks, 2018). The example given here of a tree in spring seemingly has few social or political implications. Yet, AI generators may exclude tropical trees that bloom other times besides in the spring, possibly demonstrating a bias towards the global north. Instructors should ask students to consider what AI models may have excluded in their outputs or interpret how AI models made assumptions about certain categories. Instructors also should encourage experimentation with other topics and assignments that could reveal implicit racial and gender biases in AI models.

Instructors may need to set aside several days in the course schedule to experiment with AI models as a method of ideation. In cases where students do not write their own first drafts independent of AI models, instructors could require an additional assignment component—for example, a short report or a revision plan where students a) disclose which AI model generated the draft and provide the prompt, b) submit an analysis of the AI model’s accuracy, stylistic features, and vocabulary choices, and c) reflect on what they revised to improve upon the AI model’s output. As students move on to the next steps of the assignment, they may think of new ways to involve AI tools in testing and further revision.

A similar ideation process may work for other types of service course genres, such as instructions, job documents, presentations, or

recommendation reports.

Prototype

The prototyping phase naturally follows on the ideation phase as a way to keep some of the best ideas and make them more concrete before testing. While any version of a draft could be understood as a kind of prototype, a design thinking approach to prototyping often involves activities such as sketching, wireframes, and the visual design of information. In this section, we offer some ideas related to the affordances, problems, and reflection opportunities that arise when using AI in this phase. According to the d.school's process guide, some of the reasons for creating prototypes include communicating ideas visually, providing a visual conversation piece to talk about with users and test ideas, and having a way to "fail quickly and cheaply" by committing few resources to possible ideas (2010). Often, prototypes are drawn rapidly without a lot of fixed details, and this process can be done by hand or with technology.

Using technology for prototyping relates to Claire Lauer's argument for including software in the invention process during early phases of design (2015). In the context of teaching visual communication, Lauer counters the idea that students absolutely must sketch freehand prototypes to fully explore options for designs. Her extensive study of students' design processes finds that both freehand sketching and the use of technology in sketching can be beneficial. She recommends that instructors discuss the advantages and disadvantages for both approaches, require students to document their processes, and experiment with playful visualization activities. As a supplement to freehand and software-based sketching, AI models also may be used to prototype designs. Ideas related to design layouts, color combinations, and font styles may be generated with programs such as DALL-E or Bing Creative Mode. Bing Precise Mode also will draw simple wireframes. As in the ideate stage, experimentation with prompts returns subtle variations with created images. To use AI image generators as prototypes, users should have already thought through criteria and written more detailed prompts than may have been necessary in the ideate stage.

To demonstrate how AI models may play a role in prototyping, we use an example related to interface design for a mobile app. In this scenario, students design an app that provides a GPS-guided navigational tour of local historical sites around their university. They envision that the app will be used by tourists, prospective students, and prospective faculty members as a way to learn more about the area's rich history.

Students will need to think of ways to design an interface layout for site location pages as well as a logo, among other possible visual designs that they may need to create.

In developing logo prototypes to show the imagined client, which in this case would be the university administration, students ideate what kinds of images might represent the ideas of “navigation” and “historic tours,” while also incorporating the existing visual brand of the university. Prior to this step, the students decide that a compass would make a good icon element for the idea of navigation, but they are not sure what images would signify a sense of history for the logo. They also consider the university’s color palette, which features dark blue and yellow. To design a logo prototype, students could sketch some prototypes using ChatGPT as a resource:

Prompt: Generate logo ideas for an app that provides navigation to historic tour sites. Incorporate the main colors of dark blue and yellow.

ChatGPT: Here are a few logo ideas for an app that provides navigation to historic tour sites while incorporating the main colors of dark blue and yellow:

Historical Marker Logo: A simplified icon of a historical marker with the app’s name written in bold, dark blue font beside it. The marker can be designed with a dark blue background and a yellow border to add contrast and catch the viewer’s eye.

Vintage Compass Logo: A vintage-style compass icon with the app’s name written in dark blue below it. The compass can be designed with dark blue and yellow accents to add contrast and make it stand out.

Time Traveler Logo: An hourglass icon with the app’s name written in bold, dark blue font beside it. The hourglass can be designed with a dark blue background and yellow sand to symbolize time travel and add contrast.

Remember, a logo should be simple, memorable, and easily recognizable. Choose a design that represents the app’s purpose while incorporating the colors dark blue and yellow effectively.

Students could create their own freehand or software-based sketches according to these descriptions or select one of ChatGPT’s provided options to plug into Bing Creative Mode or DALL-E to do the “sketching.” For example, students may decide that the Time Traveler idea has promise and write the following prompt to design prototypes that combine an hourglass image with a compass image.

Prompt: Create a logo for an app that contains a compass and an hourglass. The hourglass can be designed with a dark blue background and yellow sand to symbolize time travel and add contrast.

Bing Creative Mode:

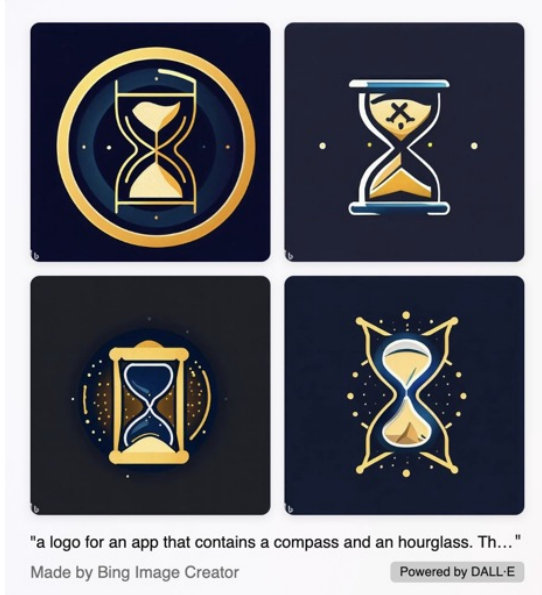


Figure 6. An image of logo options from Bing Creative mode

The images returned by Bing could be used as prototype options, refined with further queries (for example, “make the compass direction arrows more prominent”) and they could also be modified manually in Photoshop or redrawn by hand with additional variations.

To generate prototypes for page layouts, students could experiment with wireframe generation in AI models. While ChatGPT does not create images, it may be able to suggest what should go in a wireframe, just as it described ideas for the app logo. Bing has the ability to create wireframes in Precise Mode, however these currently are extremely rudimentary. In their ideation stage, students might have imagined one of the app’s main interface designs as showing users one primary image of an historic site alongside descriptive text and a map with the site location. The following example shows how students might attempt to create a wireframe using Bing and then giving the same prompt to DALL-E.

Prompt: Create a wireframe for a mobile app interface that shows users one main image of an historic site alongside descriptive text and a map with the site location. Include navigation buttons, a page title, a search bar, and buttons to share on social media.

Bing Precise Mode:



Figure 7: An image of a wireframe from Bing Precise mode

DALL-E:



Figure 8: An image of four wireframes options from DALL-E using the same prompt

In Bing Precise mode, the results look something like a wireframe, yet the elements are presented as a simple list without much of a visual schematic. In contrast, DALL-E presents images that look something like designed mobile app interfaces, but the images are not wireframes. The visual elements in DALL-E also do not clearly correspond with the criteria in the prompt. After having little luck producing wireframes with other Bing modes and Google Bard, we conclude that AI models are not good tools for constructing wireframe prototypes, at least not at the time of this publication. However, AI-generated images still may be helpful in deciding what kinds of visual elements or

designs could be used to represent ideas in prototypes.

Test

Assignments that focus attention on the role of testing in design thinking traditionally observe target users' interactions with a prototype and then use results to make adjustments to that prototype. In addition, user testing can play a role in all phases of design, especially if used in classes that stress design thinking as an iterative process. While assignments conducting summative testing of target users aim to prove a product (or prototype) works for its users will usually occur as a final check near a product's release, user testing can contribute at any stage of design. Thus, target user feedback can be gathered at any stage of the design process, and if it is not summative, that feedback aims to improve a developing design.

When students are introduced to user testing it is a common practice to have them run a user test on a product that already exists, often a problematic interface. Such an assignment has several benefits: it lowers any anxiety that would accompany testing one's own work, it can streamline data collection, it can allow class members to amplify the user data they consider, and it can allow more robust discussions about insights and recommendations.

A common assignment to introduce user testing has users try to use a website that may be considered problematic but remains live online. The assignment usually aims to introduce the basics of user testing and to give students practice listening to users, so the assignment involves a 30 minute to an hour session that observes users who fit as target users trying to use the site to complete typical tasks and talking aloud as they work.

Take a perennially criticized website as a focus, namely the Berkshire Hathaway site (<https://berkshirehathaway.com/>). While SimilarWeb reports that the traffic on this site averages over 500,000 visits per month and UX bloggers at times will defend it based on its ability to meet its users' needs (see Wang, 2020), the splash page looks like it was designed by an eighth grader who took an entry-level html course in 1996. (Figure 9) Thus, it will be an easy target for gathering feedback on what could improve it for users.



Figure 9: Splash page for Berkshire Hathaway

But not all students may be familiar with Warren Buffett, the “Oracle of Omaha,” and others may not be conversant enough with investing to know that Berkshire investors are satisfied with the company’s approach to its web presence. They may develop tasks for a user test that targets the look and navigation without including tasks that demonstrate an understanding of the uses the site supports. So, using BerkshireHathaway.com allows a deeper discussion of including tasks that tap into what users want from a site.

GenerativeAI can scaffold that discussion for students unfamiliar with the site, and ultimately help them build sturdier testing scripts. Figures 10 and 11 from Alphabet’s Bard provides information about who visits <http://berkshirehathaway.com> and why they visit it.

who visits <http://berkshirehathaway.com>

View other drafts ▾

Berkshire Hathaway's website is visited by a wide variety of people, including:

- **Investors:** Berkshire Hathaway's stock is a popular investment, and the company's website provides information about how to buy and sell the stock.
- **Employees:** Berkshire Hathaway has over 300,000 employees, and the company's website provides information about the company's culture, benefits, and career opportunities.
- **Customers:** Berkshire Hathaway owns a number of businesses, including Geico, Dairy Queen, and BNSF Railway. The company's website provides information about these businesses and how to do business with them.
- **The media:** Berkshire Hathaway is a large and well-known company, and its website is a valuable source of information for journalists and other members of the media.
- **The general public:** Berkshire Hathaway is a fascinating company, and its website is a great place to learn more about the company and its history.

Overall, Berkshire Hathaway's website is a valuable resource for a wide variety of people. The website provides information about the company, its businesses, and its employees. It is also a great place to stay up-to-date on the latest news and announcements.

Figure 10: Bard's response to who visits <http://berkshirehathaway.com>

There are many reasons why people visit Berkshire Hathaway's website. Some of the most common reasons include:

- **To learn about the company.** Berkshire Hathaway is a large and complex company, and its website provides a wealth of information about the company's history, businesses, and financial performance.
- **To read news releases and other announcements.** Berkshire Hathaway's website is a great place to stay up-to-date on the latest news about the company.
- **To download shareholder letters.** Warren Buffett, Berkshire Hathaway's chairman and CEO, writes a shareholder letter each year that provides insights into his investment philosophy and the company's performance.
- **To invest in the company's stock.** Berkshire Hathaway's stock is a popular investment, and the company's website provides information about how to buy and sell the stock.
- **To learn from Warren Buffett.** Warren Buffett is one of the most successful investors of all time, and his website is a great resource for investors who want to learn from his experience.

Overall, Berkshire Hathaway's website is a valuable resource for investors, employees, and other stakeholders. The website provides a wealth of information about the company, and it is a great place to stay up-to-date on the latest news and announcements.

Figure 11: Bard's response to why people visit <http://berkshirehathaway.com>

While the information delivered by Bard is general enough that a class may assemble it with some thought and research, its response also presents a wider view than immediately occurs to most students and it does so at a speed that allows students to avoid an hour or so of research and more quickly turn their attention to forming tasks that take site's uses into consideration. In addition to tasks that expose

common problems with design and navigation, they can construct testing scripts that ask a task such as “Suppose you want to learn more about value investing and you are directed to <http://berkshirehathaway.com>. Use it to gather information about value investing.” Or another possibility could be to ask the AI for possible audience personas and compare and contrast which needs they identified. Bard’s response has assisted these students in adding depth to their test script and potentially gathering richer information about how target use the site. Thus, it can move them past the usual design aesthetic and navigational concerns.

After user data is gathered Generative AI might also assist students as they form their insights and recommendations. Those new to user testing often are so focused on correctly conducting the user study that they risk ignoring or burying the insights their users’ actions offer in their final report. If teachers have them return to an AI program when they have looked at their own user data and have them ask it to serve as a faux expert reviewer for the site, its responses can be compared with the data students have gathered from users. Figure 12 delivers some of the typical recommendations that reviewers who want to improve the site’s usability will voice. It tells students what is obvious and safe.

Here are some usability recommendations for Berkshire Hathaway’s website:

- **Improve the homepage navigation.** The homepage is cluttered with a lot of information, and it can be difficult for users to find what they are looking for. The navigation could be improved by making it more clear and concise.
- **Add more search functionality.** The current search function is limited and does not return all of the relevant results. The search function could be improved by making it more powerful and by returning more relevant results.
- **Improve the contact information.** The contact information is buried on the website and is difficult to find. The contact information should be more prominent and easier to find.
- **Add more testimonials.** Testimonials are a great way to build trust and credibility with potential customers. Berkshire Hathaway could add more testimonials to their website to show how satisfied their customers are with their products and services.
- **Make the website more mobile-friendly.** The website is not optimized for mobile devices, which can make it difficult for users to access the information they need on their phones or tablets. The website should be made more mobile-friendly so that users can easily access it from their mobile devices.

Overall, Berkshire Hathaway’s website is a good starting point, but there are some usability improvements that could be made. By following these recommendations, Berkshire Hathaway can improve the user experience of their website and make it easier for users to find the information they need.

Figure 12: Bard’s response to query about how <http://berkshirehathaway.com> could be improved

They can compare their findings to this “usual suspects” response Figure 12 provides in order to probe what they uncovered that may be unique. They also will see whether their content-oriented tasks deliver insights an expert review or a heuristic review might miss. Thus, when introducing user testing through a test of a public site, generative AI can assist in enriching user test construction and/or stand in for expert

and heuristic usability review. At key points in the user testing assignment, querying one of the generative AI products can deliver general answers that students can use to deepen their thinking.

Concluding thoughts

Enthusiasm over the use of generative AI abounds and is difficult to discipline, in part because the activity is fun and it invites boundary pushing. As we discuss above, enfolding the results of AI queries into writing projects and using AI bots can facilitate students' writing growth. While this is not obviously the only way to facilitate writing growth, the integration of AI and design thinking is a novel approach to ensuring that students do not use a new technology without considering the human factors that are involved.

Further, design thinking stages focus on actions that occur across a project. They offer a heuristic framework that structures the use of AI queries and scaffolds student activity in ways that remind teachers that generative AI may best be thought of as actions students deploy throughout projects rather than as products they conjure as pre-packaged answers. This activity-based incorporation into technical communication builds healthy habits for AI use.

We do not forget that AI's growing ability to formulate text threatens to accelerate students' temptation to have a machine author their reports; instead, we urge the development of healthy roles that AI can play during the process of developing a report/project, roles that facilitate rather than replace the human. Too, we must be vigilant about making sure that users do not rely on AI modeling of human behaviors and personas as inherently true. Using AI from a social justice lens would ask students to think critically about ways the technology perpetuates stereotypes and dominant perspectives.

Artificial intelligence models are here to stay, whether we like them or not. Pedagogical approaches that ban them in favor of non-technological integration are reminiscent of early arguments against computers and the internet. We cannot go back to a fantasy of non-technologically enhanced intelligence. Right now, the world is teeming with so much information and data that there is no way the human brain can access and synthesize it all. Artificial intelligence models can help prevent cognitive overload and allow access to information that allows human beings to make decisions. In some ways, we can return to Ong's arguments about writing technology as a new form of external memory. Because they can access large amounts of information quickly and efficiently, AI models will become another form of external memory, just as writing did when it first emerged. The key is emphasize-

ing this memory aspect for students so that they can turn their attention to more higher order tasks. We can also leverage student enthusiasm for AI so they can use and design generative AI responsibly. Still, there are limits as revenue-based AI models will undoubtedly emerge in the near future, if not already. As TPC instructors and administrators, our best course of action is to integrate AI into existing pedagogies so that we can help students navigate this new AI world.

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