

Leveraging Design Thinking and Generative AI to Transform TPC Pedagogy

Nadya Shalamova

Milwaukee School of Engineering

Tammy Rice-Bailey

Milwaukee School of Engineering

Abstract: Generative Artificial Intelligence (AI) has taken the world by storm and reached an inflection point in 2023 with the release of several influential large language models, most notably the open source ChatGPT-3 and ChatGPT-4 by OpenAI. Generative AI technologies can instantly produce multimodal content, impacting many disciplines that were previously considered immune to automation. Technical and Professional Communication (TPC) industry and pedagogy stand to be profoundly transformed by generative AI, necessitating new ways of thinking, teaching, and learning. In this article, we call on TPC educators to consider incorporating generative AI tools into their curriculum to serve as a powerful tool in the teaching and practice of design thinking. Furthermore, we postulate that generative AI can prepare students for the rapidly changing work landscape dominated by AI technologies. Drawing from our experience of teaching an undergraduate technical communication course, we provide examples of leveraging generative AI technology, such as ChatGPT, to facilitate students' deeper understanding of the design thinking process. Our intent is to raise awareness of generative AI potential, stimulate further research, and improve opportunities in TPC pedagogy and programmatic development.

Keywords: Generative AI, design thinking, technical communication

Generative Artificial Intelligence (AI) technologies have taken the world by storm. In 2023, generative AI has reached an inflection point (McPhillips, 2023) with the release of AI models and systems such as ChatGPT-4 and DALL-E 2 by OpenAI, Stable Diffusion, Midjourney, Google Bard, Copilot and Bing by Microsoft 365, Adobe Firefly, and many others. Generative AI refers to an algorithmic process that enables almost instantaneous real-time creation of statistically probable content from vast amounts of unstructured or unlabeled data.

The quick adoption of generative AI technologies is credited with such powerful features as creating various types of output (text, images, music, videos, websites, apps, code, etc.) and performing unsupervised learning, i.e., finding patterns and making conclusions from the unlabeled data. Generative AI tools can not only replicate existing content but can add new and unique elements to it. For example, generative large language models like ChatGPT, Jasper, GhostWriter and many others can be used to produce all kinds of professional and personal writing, or even creative writing pieces. Similarly, AI image generators like DALL-E 2 and Midjourney can create highly detailed images from text prompts, while AI assistants like Microsoft Copilot can generate lesson plans and other educational materials in a matter of minutes. These advanced AI tools are just a few examples of the generative AI landscape whose boundaries appear to expand daily. With their ability to produce multimodal outputs instantly, generative AI technologies have the power to transform many areas traditionally thought unsusceptible to automation.

The finer points of educating young adults embarking on their professional careers is one such area that will see the impact of this automation. While research on this topic is still in its early stages, students and instructors are already using ChatGPT in the classroom (Wood & Kelly, 2023). This use is only expected to increase (Maslej et al., 2023; Turnitin, 2023). Considering this reality, the immediate concern that should come to mind for Technical and Professional Communication (TPC) administrators and educators is, "What are the opportunities of generative AI in TPC programs?"

One of these opportunities is to use generative AI in the teaching and practice of design thinking. Design thinking has been embraced by the TPC community as an approach that can enhance reader-centered writing, collaboration, project management, and development of instructional materials (Leverenz, 2014; Pope-Ruark, Tham, Maoses, & Conner, 2019; Purdy, 2014; Shalamova, 2016; St. Amant, 2022; Tham, 2021). At the same time, scholars note several challenges in implementing design thinking into the existing TPC pedagogical framework. These challenges include, but are not limited to, faculty resistance, a lack of familiarity or expertise in design thinking methodology, and time needed to master design thinking tools (Bay, Johnson-Sheehan, & Cook, 2018; Overmyer, & Carlson, 2019; Pope-Ruark, 2019; Tham, 2022; Verhulsdonck, Howard, & Tham, 2021; Wible, 2020). To date, there is no consistently adopted framework for integrating design thinking into TPC instruction. Generative AI offers the opportunity to create such a framework. In this paper, we argue that TPC programs would be well-served to examine how to leverage generative AI technologies in their curriculum. More specifically, we suggest that generative AI tools can address the challenges of incorporating the design thinking approach into technical communication courses and help students develop a deeper understanding of design thinking and rhetoric. Drawing from our experience teaching an undergraduate service technical communication course at our university, we provide examples of implementing design thinking and ChatGPT into the writing process. Furthermore, we discuss the challenges and critical considerations for using this approach. Our intent is to help raise awareness of generative AI and inspire further research into its opportunities in TPC pedagogy and programmatic development.

Generative AI and the Future of TPC: A Code Red Moment

The research on the use of generative AI in higher education is still nascent, but emerging studies suggest that the success of generative AI will largely depend on how AI is integrated in higher education and that more research is needed to fully understand its potential and limitations (e.g., Stokel-Walker, 2022; Williamson, Macgilchrist, & Potter 2023).

Proponents of generative AI highlight its benefits that include but are not limited to increased efficiency and productivity, research and exploration, increased student engagement, and opportunities for creating personalized learning paths for students (Alshater, 2022; Baidoo-Anu, & Ansah, 2023; Bozkurt, 2023; Cotton, Cotton, & Shipway, 2023; Dehouche, 2021; Mor, 2022; OpenAI, 2023A; Qadir, Islam, & Al-Fuqaha, 2022; Noy & Zhang, 2023). Meanwhile, generative AI sceptics raise serious concerns about ethical, geopolitical, scientific, social, cultural, environmental, and financial implications of generative AI (Bender, Gebru, McMillan-Major, & Shmitchell, 2021; Bishop, 2023; Eloundou, Manning, Mishkin, & Rock, 2023).

In response to the quick advent and abundance of generative AI tools, both AI enthusiasts and critics have raised an alarm about the necessity to rethink and retool higher education (e.g., Bašić, et al., 2023; Chen, Chen, & Lin, 2020; Seo, Tang, Roll, Fels, & Yoon, 2021; Warner, 2022; Williamson, Macgilchrist, & Potter, 2023). Some even consider the proliferation of AI tools as a code red moment in education or a crisis that necessitates a paradigm shift in teaching and learning. This concern is especially pivotal in the writing-focused disciplines (Grimaldi & Ehrler, 2023; Hammad, 2023; Luttrell, Wallace, McCollough, & Lee, 2020; Pavlik, 2023; Marchi & Sampieri, 2023; Salvagno, Taccone, & Gerli, 2023).

Arguably, the potential benefits of generative AI tools for writing includes reduced time and effort required to complete repetitive tasks such as formatting and proofreading, improved quality of writing, and even enhanced opportunity to remove writer's block. Moreover, generative AI can easily create content in multiple languages, opening new professional opportunities for writers (Davenport & Mittal, 2022; Lin, 2023 ; Noronha, 2023; Wood, & Kelly, 2023).

Other scientists and researchers suggest that AI generated content presents a "superficial understanding" of reality (Marcus, 2023, para 1), may contain "ineradicable defects," and lack "intellectual insights and artistic creativity" compared to human-generated content (Chomsky, 2023, para 3-4). Generative AI technologies can also be potentially misused for nefarious purposes. For example, students could abuse generative AI to create fake essays or academic papers, potentially leading to plagiarism and academic dishonesty. Additionally, students could use generative AI to create fake social media profiles or messages, potentially engaging in cyberbullying or online harassment. The ethical concerns around the ownership responsibility of the AI generated output, as well as the

potential impact on the labor market for human writers, also cannot be ignored (Dehouche, 2021; King, 2023; Goldstein et al., 2023; Salvagno, Taccone, Gerli, 2023).

Because of the widening availability of generative AI to our students, it is high time to examine the ways in which TPC instructors can integrate generative AI into the classroom. Students are already using this technology, and it is incumbent upon TPC instructors to help direct students' usage in proper and helpful ways. In the next section we present an example of how we use generative AI in the content of design thinking in a service technical communication course at our university.

Design Thinking with ChatGPT: Our Case Study

This course (GS-1002 Freshman Studies II) is an undergraduate technical communication course taken by all students at our university regardless of their discipline. Multiple sections of the course are offered by the school, and each section has a specific theme determined by the instructor. Both of us teach at least one section of GS-1002 a year. While we may slightly vary the theme of the course every semester, a recent theme we have both used is AI and smart technology. In GS 1002 we use the Stanford d.school model of design thinking that consists of five stages: Empathize, define, ideate, prototype, and test. We use design thinking throughout the course as a framework. Recently, in addition to Microsoft AI-powered assistant Editor we have added ChatGPT as an AI assistant for all course projects. This study focuses on the five activities students complete for the capstone team-based Technical Report project.

We have found that these activities (including prompt engineering) work best as a collaborative and iterative process. Both of us are advocates of student collaborations in general. Even in freshman-level classes, we start the writing students working in groups. Our reasoning is as follows: Most of their academic programs and future workplaces will require collaboration. In fact, collaboration is a top skill sought by the hiring managers of most TC workplaces (Lauer & Brumberger, 2016; Shalamova, Rice-Bailey, & Wikoff, 2018). In addition, working in groups allows the more tech savvy students to assist those who are hesitant or less experienced with technology.

The iterative process is also part of many of our writing assignments. Iteration is one area where writing pedagogy and design thinking overlap. Just as we instruct students to write multiple drafts in writing courses, design thinking similarly requires students to create and refine prototypes.

Introduction to ChatGPT Through Team Formation

After introducing students to the design thinking model, we start the project by forming student teams based on the students' interests in an AI or smart tech topic. Once the groups are formed, we immediately jump into their first task, which is to decide on a creative name for their group. We start by asking the students to come up with a team name. Often students propose generic (e.g., Engineers), silly (e.g., Comedically Large Shoe) or even inconsiderate team names (e.g., Fentanyl,

Stage Four [Cancer]). After students have made their first attempt at a name, we give one or two short lectures on effective strategies of prompt engineering for ChatGPT, i.e., how to write tailored instructions for ChatGPT to receive a relevant and meaningful response (OpenAI, n.d.; Shieh, 2023).

To start off students with prompt engineering, we ask them to use the team names they generated in their group as a starting point for formulating an effective prompt. Each team member writes a prompt individually. Then all team members share their prompts and either select the most effective prompt or combine several prompts to write a new one. We ask students to annotate their prompt to demonstrate their understanding of prompt writing. Table 1 shows an annotated prompt from a student in one of the teams and the corresponding output that ChatGPT provided.

| Student Prompt | ChatGPT Output (redacted for space reasons) |
|--|---|
| I am working with three students on a technical research project in an undergraduate technical writing course. We are writing our report on the topic of AI and healthcare [audience and context]. Give me five suggestions for team names we could use for the project [task/purpose]. Our instructor wants us to use professional names [audience]. Do not suggest goofy or insensitive names [constraints]. | <ol style="list-style-type: none"> 1. <i>The Robot Doctors</i> 2. <i>The Neural Networks</i> 3. <i>The Health Bots</i> 4. <i>The Cyber Surgeons</i> 5. <i>The Digital Diagnosticians</i> |

Table 1: Student Example of Prompt Engineering

During their second attempt at generating a team name, students are more satisfied with the suggestions of the AI. This allows us to reinforce the idea that clear and specific prompts are critical when using a generative AI tool.

Although the scope of this article does not allow us to elaborate on prompt writing strategies (see Shieh, 2023; Stanford Center for Teaching and Learning, 2023 for tips), we want to note that in the pre-generative AI times, we would typically give several lectures on the key ingredients of effective technical writing (audience awareness, clear purpose or task, clarity, accuracy, and conciseness) and compare them to the basics of crafting an effective prompt. Presenting the basics of good technical writing in the context of prompt engineering opens opportunities to engage students in the writing process in a novel way, encourage their curiosity, and enhance their awareness of the capabilities and the shortcomings of AI.

Design Thinking - Empathize

Next, we tackle the first stage in design thinking – empathize. In this stage, the focus is on understanding the needs and expectations of the audience for the

research report. Students often struggle with identifying an appropriate and/or realistic audience. They typically go for audiences that would not read (let alone trust!) a report written by undergraduate students. Once the students have come up with their initial audience, we explain that there is another option for determining an audience for their report.

We then instruct students to use ChatGPT to generate an alternative list of potential audiences for their topic. This typically yields a more relevant list. Next, we ask students to share their team prompts and the ChatGPT outputs with the rest of the class. The class then helps refine the groups' prompts to make them more specific and precise, and the students regenerate a list based on this new prompt. Table 2 shows both an example of a revised prompt used to help determine a realistic audience and the ChatGPT response to that prompt. Please note that we have slightly edited all ChatGPT responses for conciseness.

| Prompt | ChatGPT Output |
|--|---|
| <p>Assume that you are an undergraduate engineering student who is taking a technical writing course [<i>audience</i>]. You are tasked with writing a research report on the use of AI in healthcare. Suggest at least four realistic audiences who would be interested in reading the report [<i>purpose</i>]. Focus on the types of audience who would be inclined to read and trust a report written by an undergraduate student on the topic [<i>constraints</i>]. Describe each audience and their technical knowledge of the topic. How might the audiences benefit from the report? [<i>specific task</i>].</p> | <ol style="list-style-type: none"> 1. <i>Professors and academics in the field of engineering and healthcare:</i> This audience consists of experts who are knowledgeable about the topic and are likely to be interested in reading the report written by an undergraduate student. 2. <i>Other undergraduate and graduate students in engineering and healthcare:</i> This audience may not have as much technical knowledge as the experts but are likely to be interested in the topic and can provide feedback from a student perspective. 3. <i>Patients and patient advocacy groups:</i> This audience may not have a strong technical background but are interested in learning about how AI can be used to improve healthcare outcomes. |

Table 2: Design Thinking Empathize Phase with ChatGPT

Next, we have teams look at the ChatGPT suggestions and select one audience. Students are encouraged to modify the audience and/or combine multiple suggestions, if necessary. Once the groups have arrived at their final audience, we move on to the next stage of the design thinking process. As part of our debrief for this task, the class discusses some of the benefits of coming up with initial ideas on their own and the challenges of working with the initial ChatGPT output.

Design Thinking - Define

The second stage in the design thinking process is to define. In this step, students

define a focused topic for their target audience. They start with asking (and answering for themselves) “How Might We” (HMW) questions. Because students have already defined a clear and realistic audience with the help of ChatGPT, they can quickly move into defining a feasible topic for their report. After student groups have amassed a few ideas for a targeted topic, we again direct them to ChatGPT.

We instruct them to write a prompt in which they ask ChatGPT to provide ideas for five to seven subtopics that relate to their general topic. Table 3 shows an example of a student prompt that yielded several options for narrowing the topic from ChatGPT.

| Prompt | ChatGPT Output |
|---|--|
| Continue acting as an undergraduate engineering student who is taking a technical writing course [<i>role: act as</i>]. You are tasked with writing a research report on the use of AI in healthcare. Help me narrow down the topic of AI in healthcare for the target audience of other undergraduate and graduate students in engineering and healthcare [<i>task</i>]. Use the HMW question as the framework [<i>narrowed task</i>]. My audience may not have as much technical knowledge as the experts but are likely to be interested in the topic and can provide feedback from a student perspective [<i>specific context</i>]. Give me examples of five- seven subtopics for this audience [<i>target audience</i>]. | <ol style="list-style-type: none"> 1. <i>AI and healthcare diagnosis:</i> HMW use AI in healthcare to diagnose and treat diseases. 2. <i>AI and personalized medicine:</i> HMW use AI to tailor medical treatments to individual patients. 3. <i>AI and predictive analytics:</i> HMW use AI to predict patient outcomes and improve clinical decision making. 4. <i>AI and medical imaging:</i> HMW use AI in medical imaging to improve diagnosis and treatment. 5. <i>AI and electronic health records:</i> HMW use AI to manage electronic health records and improve patient care. |

Table 3: Design Thinking Define Phase with ChatGPT

We ask the students to work within their groups to review the ChatGPT suggestions and to select one. Alternately, student groups may define their own subtopic by combining various ChatGPT suggestions.

Design Thinking - Ideate

In this stage, the focus is on generating ideas for how the report can best address the defined problem statement and research question. This involves brainstorming various aspects of the topic, using ideation techniques. Students are encouraged to brainstorm such things as HMW/research question, organize the concepts, or find an angle on their research topic. For example, we ask students to use such

design-thinking brainstorming techniques as Crazy 8s, rapid mind mapping, and concept prioritization. Typically, we use Mural brainstorming templates (Mural, n.d.) to have students to work on their list of their ideas. We have also tried other virtual collaboratives such as Miro, Figma Jam, or MS Teams Whiteboard. Alternatively, we ask students to use handwriting or sketching for brainstorming when setting a up a Mural canvas takes up too much time..

The goal of this stage is to help students generate ideas that can answer their research questions. Students can use various ideation techniques to brainstorm different aspects of their topic, such as HMW/research question, concept organization, and research angle. Some examples of ideation techniques are Crazy 8s, rapid mind mapping, and concept prioritization. Students can use Mural templates or other virtual collaborative tools such as Miro, Figma Jam, or MS Teams Whiteboard to share their ideas. Alternatively, they can use handwriting or sketching for brainstorming if setting up a virtual space is time-consuming.

The ideate stage also involves using ChatGPT as a search engine. It is important to remind students of ChatGPT's limitations for research: 1) ChatGPT was trained on publicly available data prior to 2019 or 2021 (depending on the version) and 2) ChatGPT can generate fake sources and citations. Therefore, we ask students to conduct additional research and verify their sources with Google Scholar and online library databases.

When students have a required number of credible sources, they can use ChatGPT to summarize each source. First, we teach students how to write good summaries and show them examples from previous reports. After summarizing, students should look for patterns in their sources and create an outline for their report. ChatGPT can also help with finding patterns, but we encourage students to use their own critical thinking skills. Tables 4 and 5 show some examples of prompts and ChatGPT suggestions for this stage.

| Prompt | ChatGPT Output |
|--|---|
| <p>Continue acting as an undergraduate student in the technical writing course [<i>role</i>]. Find ten peer-reviewed sources for my technical research report. My research question is How might we use AI in healthcare to diagnose and treat diseases? [<i>task</i>]. The report is intended for the audience of undergraduate students in computer science, biomedical engineering, and nursing [<i>audience</i>]. Find ten credible articles published from 2010 to 2022. The article should be written at the level I can understand. Document all sources in APA [<i>limitations</i>].</p> | <ol style="list-style-type: none"> 1. Esteva A.; Robicquet A.; Ramsundar B.; Kuleshov V.; DePristo M.; Chou K.; Cui C.; Corrado G.; Thrun S.; Dean J.; (2019). A guide to deep learning in healthcare. <i>Nature Medicine</i> 25:24–29. 2. IBM. (n.d.). Artificial Intelligence in Medicine. Retrieved January 30, 2022, from https://www.ibm.com/topics/artificial-intelligence-medicine 3. Jiang F; Zhang J; Wang Y; (2018) Challenges of artificial intelligence in medical imaging analysis and diagnosis. <i>Engineering</i> 4:181–183. 4. Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial intelligence in healthcare: past, present and future. <i>Stroke and vascular neurology</i>, 2(4), 230–243. https://doi.org/10.1136/svn-2017-000101 |

Table 4 Design Thinking Ideate Phase with ChatGPT: Conduct Supplemental Research

| Prompt | ChatGPT Output (redacted for space reasons) |
|--|--|
| <p>Summarize the first article for my research question How might we use AI in healthcare to diagnose and treat diseases? [task]. Each summary must include the main idea, a list of the key points, a short explanation of how it is related to my research question and an APA in-text citation [context]. Limit the summary to 300 words [limitations].</p> | <p>The article by Esteva et al. (2019) provides a guide to deep learning in healthcare, centering on deep learning in computer vision, natural language processing, reinforcement learning, and generalized methods. The authors describe how these computational techniques can impact a few key areas of medicine and explore how to build end-to-end systems. The article covers the following topics: computer vision, natural language processing; reinforcement learning, generalized methods. The article is related to the research question of how to use AI in healthcare to diagnose and treat diseases because it provides an overview of the current state-of-the-art and future directions of deep learning in various aspects of healthcare. It also discusses the challenges and opportunities of applying deep learning to healthcare, such as data availability and quality, interpretability and explainability, privacy and security, and ethical and social implications.</p> |

Table 5 Design Thinking Ideate Phase with ChatGPT: Summarization of Sources

Design Thinking - Prototype and Test

Prototyping and testing are the two last stages in the design thinking process. In the case of the technical research report, an outline and draft versions of the report constitute iterations of the prototype. Students start this step by devising a basic outline for their report as a group, then “dividing and conquering” to write initial drafts of each major section (not including the introduction, conclusion, or abstract). Students’ initial work is done in a shared Microsoft Word online file on OneDrive. This enables us, instructors, to provide feedback on various draft iterations and review the history of the file.

Next, we instruct students on how to provide constructive feedback on their teammates’ sections. Armed with feedback from their peers and the instructor (who also comments in the shared document), students revise their initial draft sections. Once they have implemented the feedback and the draft is in good shape, we instruct the groups to consult ChatGPT once again for assistance. We encourage the groups to enter their draft (along with a relevant prompt) into ChatGPT. In this step, students can ask ChatGPT to find and summarize credible sources, identify key themes and patterns in them, and ask for suggestions to improve their draft. Students are also required to use Editor, Microsoft AI-powered service, throughout the writing process, throughout the writing process. Due to the number of tasks and iterations involved in this step, the prototype may take several class periods to complete.

After students have created a solid draft, students then engage in the final step of the design thinking process, which is to test or validate the report to ensure it addresses the research question and assignment requirements and is relevant to the target audience. We instruct students to formulate a prompt that asks ChatGPT to check if the report meets the project requirements based on the project grading criteria.

Lessons and Implications

This technical report project gives students the opportunity to consult ChatGPT throughout the DT process. Feedback we have received from students (as well as our own observations and the quality of the students' final projects) indicates that Generative AI tools like ChatGPT can enhance engagement and productivity in class, but they cannot replace student work. Instead, these tools should be used as a starting point to guide students through the design thinking process more efficiently. In this section, we discuss key discoveries we made through our classroom use of ChatGPT.

Leveraging Rhetoric to Teach Prompt Engineering and Foster Critical Thinking Skills

With the rapid adoption of generative AI technologies, "prompt engineering" or the ability to craft an effective request for a generative AI technology becomes an essential digital literacy skill students need to master to succeed in an AI-dominated future. As we described in our case study, students need to adhere to the basics of the rhetorical situation (formulating a clear purpose, identifying the target audience, providing specific and relevant context, and defining constraints) to ensure a useful output from ChatGPT.

Putting rhetorical theory in the context of AI-driven tools helps students not only appreciate the importance of a well-formulated prompt, but also understand that even with AI tools, good writing remains relevant and requires time and effort to develop. TPC instructors whose expertise is typically grounded in rhetoric are perfectly positioned to teach prompt engineering as a new writing domain. As Sandra Jamieson (2022) notes, "We have the tools, the theory, and a history of successful pedagogy to shape a response. And we should do so" (p. 153).

Embracing the Inflection Point: Adapting to AI Disruption

While the specifics of generative AI implementation in TPC pedagogy remain to be seen, it is evident that AI technologies are disrupting writing disciplines and the writing fields. Companies that focus on developing educational platforms and multimedia content creation software (e.g., Adobe, Canva, GrammarlyGO, Turnitin, etc.) have already implemented generative AI capabilities to accelerate the productivity of the writing and design processes. The adoption of generative AI tools necessitates that educators confront the challenge of acquiring new AI skills and rethink the development of instructional materials and assessment practices.

To adapt to the rapidly changing AI landscape, TPC programs should consider

creating opportunities for students to supplement their learning experiences with generative AI technologies. These experiences should focus on enhancing, rather than replacing, human instruction or writing. Furthermore, the meteoric advent of generative AI necessitates unique curriculum innovation opportunities for TPC programs.

Imparting the Relevance of Design Thinking to Technical Communication

Our experience suggests that ChatGPT can be used to enhance the adoption of design thinking methodology in TPC and help students become more comfortable with AI technologies. This could also include gaining knowledge of industry language for various design processes and appreciating the significance of technical communication classes in their curriculum. Understanding the relevance of this course material will allow the student to see a technical communication course as an enhancement rather than a nuisance in their degree requirements.

Staking a TPC Claim to Interdisciplinary Research in Generative AI

Given the broad integration of AI technology in personal and professional domains, a growing body of work calls for interdisciplinary research at the intersection of AI, social science, linguistics, and writing (Hohenstein, et al., 2021). TPC has already been characterized as evolving at the junction of several disciplines (Lauer & Brumberger, 2016; Shalamova, Rice-Bailey, & Wikoff, 2019) with a more recent focus on the merge of UX and TC (Redish & Barnum, 2011; Verhulsdonck & Shalamova 2020). TPC programs can create new specializations that focus on the use of AI tools in creating content (e.g., prompt engineering).

TPC has a lot to offer to share the development of ethical and inclusive AI models. TPC educators and professionals can contribute to the development and improvement of large language models by providing their expertise for curating datasets used to train generative AI models for quality, i.e., evaluating accuracy and relevance of the content in the dataset, identifying potential stereotypes and ethical challenges. As OpenAI invites more researchers to investigate “risky emergent behaviors, such as situational awareness, persuasion, and long-horizon planning” and “Interpretability, explainability, and calibration, to address the current nature of “black-box” AI models” (OpenAI, 2023 A, p. 69).

TPC academic programs can create enhance their curriculum and student learning outcomes by teaching students how to integrate AI models in the writing process. Furthermore, TPC programs can develop training materials on the efficient and ethical use of generative AI for AI novices.

Helping Students Navigate Generative AI Traps

It is important to have a conversation with students that while ChatGPT can be a helpful tool, it is prone to limitations and significant flaws. In our class we focus on three important issues of ChatGPT: AI hallucinations, plagiarism, and privacy.

AI hallucinations refer to AI-generated output that is not based on factual and

reliable evidence, but is either highly speculative, incorrect, biased, or simply false. For example, when asked to generate a research paper, ChatGPT is known for providing fallacious citations. AI hallucinations can also result from the “encoded bias” and various “stereotypical associations” that are rooted in the types and characteristics of the training data sets used in large language models, including ChatGPT (Bender et al., 2021, p. 614). As Gary Marcus warns us “if we cannot count on our AI to behave reliably, we should not trust it.” (2020, p. 3). TPC instructors can use the concept of “hallucinations” to help students uncover limitations, biases, and ethical challenges of AI-generated content. To further students’ knowledge and application of generative AI in TPC, instructors can have students research and analyze AI development guidelines developed by technology companies such as Google, Microsoft, OpenAI, IBM, LinkedIn, etc. Inviting students to have conversations about generative AI in TPC classes can be one of the first steps in developing a common ground for the use of AI in education.

Plagiarism is another topic used to discuss balance between the benefits and risks of generative AI. In his recent article “the False Promise of ChatGPT” Noam Chomsky (2023) criticizes text-generating AI tools such as ChatGPT. Although Chomsky recognizes ChatGPT as one of the “marvels of machine learning” (2023, para 2), he labels ChatGPT as a tool for sophisticated “plagiarism” incapable of “moral thinking” (2023, para 14, 17). Chomsky further explains that ChatGPT simply “summarizes the standard arguments in the literature by a kind of super-autocomplete” (2023, para 17). While Chomsky’s view of ChatGPT’s plagiarism in the context of large language models may be debatable, it deserves attention. After the release of the free version of ChatGPT in November 2022, the issue of plagiarism with ChatGPT became one of the thorniest discussion questions by educators (e.g., Barnett, 2023; Westfal, 2023).

Privacy is another concern that we share and discuss with students. In our case, when we introduced ChatGPT as an AI assistant in GS-1002 in the winter quarter of 2022 (winter quarter starts at the beginning of December), most of the students already had and were using ChatGPT-3.5 prior to taking the course. However, we reminded students that by using any generative AI platform, they may be sharing personal details by setting up an account with OpenAI. We also discuss how AI language models, including ChatGPT, are trained using the very data that the students (and others) input. For this reason, students may be unintentionally perpetuating or amplifying any biases contained within that data. It should be noted, that since our class concluded (in the spring of 2023), OpenAI, the creators of ChatGPT have tightened their privacy settings, and students may choose to disable their chat history that is used to train the language model (OpenAI, 2023B).

As generative technologies continue to spread like fire, some universities and schools have banned the use of ChatGPT in the classroom. Others have embraced technology and created academic integrity policies that address the use of generative AI in class. To date there is no generally accepted understanding of appropriate use of ChatGPT in teaching and learning. Our own university’s academic integrity policy does not specifically address the use of ChatGPT, although we are working on it. The absence of clear policies makes it challenging to impart the importance of writing an original report or description especially to undergraduate

engineering students who often resist writing classes or view them as an unnecessary burden on their curriculum tracks.

Avoiding AI Dependence and Weathering an AI Withdrawal

As we have acknowledged throughout the article, intelligent technologies pose several concerns, especially the risk of becoming dependent on them. The question of how to coexist with these technologies is crucial in the era of deep learning and machine learning. As John Markoff asked in his seminal work "Machines of Loving Grace" (2016), Should we control the machines, or should we let them control us?

This question became relevant in our teaching with ChatGPT. The free version of ChatGPT was frequently at capacity or riddled with technical bugs, causing problems for some students who over relied on ChatGPT in their writing process. We noticed that some students faced difficulties when they relied too much on ChatGPT and did not plan their writing well. They waited until the last minute to formulate a good prompt or put their drafts through ChatGPT for feedback. As a result, these students submitted shallow and, in some cases, unacceptable work. Furthermore, some students would go down the rabbit hole with ChatGPT by toying with the tool and creating prompts "just for fun." However, when students were not allowed to use the tool in class, some of them displayed a behavior that can be characterized as "an AI withdrawal." They lost their interest in the project, disengaged from their group members and with the course in general. Our experience shows that TPCs instructors should caution students about the effects of AI withdrawal and guide them carefully through the design thinking process when using ChatGPT.

Another question that we need to consider is what happens when students lose access to the free version of ChatGPT? ChatGPT-3.5 is currently accessible to anyone with good Internet connection (provided that the platform is not overloaded). However, OpenAI may discontinue the free version of ChatGPT-3.5 in the future. In this case, it seems that at least in the short-term, there would be a delineation between those who can afford to pay for progressive AI, and those who cannot. As TPC instructors we need to remember that ChatGPT could become one of those technologies that exacerbates the already established digital divide separating technologically privileged and marginalized or disadvantaged digital communities (Sambasivan, 2019; Sambasivan & Holbrook, 2019; Shalamova, 2019).

Conclusion

Many writing instructors are asking themselves, "How will we stop students from using AI on writing assignments?" The simple answer is: We cannot. But here is what we can do: We can promote responsible and ethical AI use. We can also teach students how to critically evaluate AI-generated content" should be "We can also teach students how to critically evaluate AI-generated content by discussing factors such as accuracy, reliability, and potential biases. We can explore together how AI could be used as a tool to enhance students' writing skills. We can proactively inform students that we are actively using AI tools to ferret out cheating and calling out that cheating.

All of these ideas have one thing in common: They require that we, ourselves, learn how to use generative AI. They also require that we find ways to make generative AI work for writing instruction and that we share these ways with our contemporaries. The primary topic of this case study, teaching students how to write effective prompts, is one such area. Promoting responsible AI use, students can benefit from the advantages of AI while maintaining the integrity of their writing assignments.

Both TPC literature and our experience of teaching the undergraduate service technical communication course at our university show that design thinking can be a useful framework with its focus on the importance of defining a clear purpose, generating ideas, prototyping, and testing. These steps ensure that the final deliverable meets the needs and expectations of the target audience. Integrating generative AI technology (such as ChatGPT) into this framework provides several benefits to the students' writing project. Using ChatGPT both before and during the design thinking process has also allowed us to rethink our approach to instructional design, teaching, and learning. Of course, along with opportunity, comes challenge. The challenge that TPC educators now face is akin to the challenges and learning our peers in the disciplines of computer science and mathematics had to undertake to incorporate PCs and calculators into their classroom (Toscano, 2023).

While we recognize the challenges of generative AI in teaching and learning, we believe that generative AI offers new opportunities for TPC pedagogy and practice. Furthermore, we encourage TPC programs to consider creating new learning modules or even writing courses that teach students how to use rhetoric as a framework for writing effective prompts. As generative AI becomes more ubiquitous, the demand for professionals with AI-related skills will continue to grow. Equipping our students with these skills will enhance their preparedness and marketability in a job force dominated by AI technologies. Like other academics (e.g., Jamieson, 2022; Pavlik, 2023; Wood & Kelly, 2023), we are excited by the possibilities generative AI presents to the TPC discipline, academic programs, research, and professional development.

References

- Alshater, Muneer (2022, December 26). Exploring the role of Artificial Intelligence in enhancing academic performance: A case study of ChatGPT. *SSRN*: <https://ssrn.com/abstract=4312358>.
- Baidoo-Anu, David & Owusu Ansah, L. (2023, January 25). Education in the era of generative Artificial Intelligence (AI): Understanding the potential Benefits of ChatGPT in promoting teaching and learning. *SSRN*. <http://dx.doi.org/10.2139/ssrn.4337484>
- Bay, J., Johnson-Sheehan, R., & Cook, D. (2018). Design thinking via experiential learning: Thinking like an entrepreneur in technical communication courses. *Programmatic Perspectives*, 10(1), 172-200.
- Barnett, Sofia (2023, January 30). ChatGPT is making universities rethink plagiarism. *Wired*. <https://www.wired.com/story/chatgpt-college-university-plagiarism/>
- Bishop, Lea (2023, January 26). A computer wrote this paper: What ChatGPT means for education, research, and writing. *SSRN*. <http://dx.doi.org/10.2139/ssrn.4338981>
- Bašić, Željanić; Banovac, Ana; Kružić, Ivana; & Jerković, Ivan. (2023). Better by you, better than me, ChatGPT 3 as writing assistance in students' essays. *ArXiv*, <https://arxiv.org/abs/2302.04536>
- Bender, Emily M.; Gebru, Timnit; McMillan-Major, Angelina; & Shmitchell, Shmargaret (2021). On the dangers of stochastic parrots: Can language models be too big? In *Conference on Fairness, Accountability, and Transparency (FAccT '21), March 3–10, 2021, Virtual Event, Canada*. ACM, New York, NY, USA, 14 pages. <https://doi.org/10.1145/3442188.3445922>
- Bozkurt, Aras. (2023). Generative artificial intelligence (AI) powered conversational educational agents: The inevitable paradigm shift. *Asian Journal of Distance Education*. <https://www.asianjde.com/ojs/index.php/AsianJDE/article/view/718>
- Chen, Lijia; Chen, Pingping; & Lin, Zhijian (2020). Artificial Intelligence in education: A review. *IEEE Access*, 8, pp. 75264-75278, 2020, doi: 10.1109/ACCESS.2020.2988510.
- Chomsky, Noam (2023, March 8). The false promise of ChatGPT. *New York Times Opinion*.
- Cotton, Debby R. E.; Cotton, Peter A.; & Shipway, J. Reuben. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*. <https://www.semanticscholar.org/paper/Chatting-and-cheating%3A-Ensuring-academic-integrity-Cotton-Cotton/f94c58af515c4c9621762f2276adbe14ac1031d5>
- Davenport, Thomas H., & Mittal, Nitin. (2022, November 14). How generative AI is changing creative work. *Harvard Business Review*. <https://hbr.org/2022/11/how-generative-ai-is-changing-creative-work>
- Dehouche, Nassim. (2021). Plagiarism in the age of massive generative Pre-trained

- Transformers (GPT-3). *Ethics, Science, Environment, Politics*, 21, 17-23. <https://doi.org/10.3354/esep00195>
- Eloundou, Tyna;, Manning, Sam; Mishkin, Pamela; & Rock, Daniel. (March 23, 2023). GPTs are GPTs: An early look at the labor market impact potential of large language models. *arXiv preprint arXiv:2303.10130*. <https://doi.org/10.48550/arXiv.2303.1013>
- Goldstein, Josh A.; Sastry, Girish; Musser, Micah; DiResta, Renee; Gentzel, Matthew; & Sedova, Katerina. (2023). Generative language models and automated influence operations: Emerging threats and potential mitigations. *ArXiv, abs/2301.04246*. <https://arxiv.org/abs/2301.04246>
- Grimaldi, Gianuca, & Ehrler, Bruce. (2023). AI et al.: Machines are about to change scientific publishing forever. *ACS Energy Letters*. <https://pubs.acs.org/doi/10.1021/acsenenergylett.2c02828>
- Hammad, Mohamed. (2023). The impact of Artificial Intelligence (AI) programs on writing scientific research. *Ann Biomed Eng*. 51(3):459-460. doi: 10.1007/s10439-023-03140-1
- Hohenstein, Jess, Kizilcec, Rene. F.; DiFranzo, Dominic; , Aghajari, Zhila; Mieczkowski, Hannah; Levy, Karen; Mor, Naaman; Hancock, Jeffery; Jung, Malte (2023). Artificial intelligence in communication impacts language and social relationships. *Nature Scientific Reports*, 13 (5487).doi.org/10.1038/s41598-023-30938-9
- King, Michael R. (2023). ChatGPT: A conversation on Artificial Intelligence, chatbots, and plagiarism in higher education. *Cellular and Molecular Bioengineering*, 16(1), 1-2. <https://doi.org/10.1007/s12195-022-00754-8>
- Jamieson, Sandra (2022). The AI "Crisis" and A (Re)turn to pedagogy. *Composition Studies* 50 (3), 153-157.
- Lam, Chris. (2018). Teaching design thinking in technical communication: Challenges and strategies. *Journal of Technical Writing and Communication*, 48(1), 49-72.
- Lauer, Claire, & Brumberger, Eva. (2016). Technical communication as user experience in a broadening industry landscape. *Technical Communication*, 63(3), 248-264.
- Leverenz, Carrie S. (2014). Design thinking and the wicked problem of teaching writing. *Computers and Composition*, 33, 1-12.
- Lin, Zhicheng (2023). Supercharging academic writing with generative AI: Framework, techniques, and caveats. *arXiv preprint arXiv:2310.17143*
- Luttrell, Regina; Wallace, Adrienne; McCollough, Christopher; & Lee, Jiyoung. (2020). The digital divide: Addressing artificial intelligence in communication education. *Journalism & Mass Communication Educator*, 75(4), 470-482.
- Marchi Filippo, & Sampieri Claudi (2023). From data analysis to paper writing: How Artificial intelligence is changing the face of scientific literature. *Oral Oncol*. 138:106312. doi: 10.1016/j.oraloncology.2023.106312. Epub 2023 Jan 27. PMID: 36709707.
- Marcus, Gary. (2023, February 1). Gaslighting and reality in AI. *Substack*. Retrieved

- <https://garymarcus.substack.com/p/gaslighting-and-reality-in-ai>
- Markoff, John (2016). *Machines of loving grace: The quest for common ground between humans and robots*. HarperCollins Publishers, USA.
- Maslej, Nestor; Fattorini, Loredana; Brynjolfsson, Erik; Etchemendy, John; Ligett, Katrina; Lyons, Terah; Manyika, James; Ngo, Helen; Niebles, Juan Carlos; Parli, Vanessa; Shoham, Yoav; Wald, Russell; Clark, Jack; & Perrault, Raymond (2023, April). The AI Index 2023 Annual Report. *AI Index Steering Committee, Institute for Human-Centered AI, Stanford University, Stanford, CA*. Retrieved AI Index Report 2023 – Artificial Intelligence Index (stanford.edu)
- McPhillips, Cathy. (Host). (2023, January 4). The AI inflection point is here. *The Marketing Artificial Intelligence Show*, 28. <https://www.marketingaiinstitute.com/blog/the-marketing-ai-show-episode-28-the-ai-inflection-point-is-here>
- Mor, Naaman (2022). "My AI must have been broken": How AI stands to reshape human communication. In *Proceedings of the 16th ACM Conference on Recommender Systems. Association for Computing Machinery, New York, NY, USA*, 1. <https://doi.org/10.1145/3523227.3555724>
- Mural (n.d.). Brainstorming templates. <https://www.mural.co/template-categories/brainstorm>
- Noronha, Jeremy. (2023, March 13). ChatGPT and Generative AI: The Future of Content Creation. *Writesonic*, <https://writesonic.com/blog/chatgpt-generative-ai/>
- Noy, Shakked, & Zhang, Whitney (March 1, 2023). Experimental evidence on the productivity effects of generative Artificial Intelligence. *SSRN*. <http://dx.doi.org/10.2139/ssrn.4375283>
- OpenAI. (2023A, March 15 & 27). *GPT-4 Technical Report*. <https://doi.org/10.48550/arXiv.2303.08774>
- OpenAI (2023B, April 25). New ways to manage your data in ChatGPT. <https://openai.com/blog/new-ways-to-manage-your-data-in-chatgpt>
- OpenAI (n.d.). *Introduction: Prompt Design*. <https://platform.openai.com/docs/introduction/overview>
- Overmyer, T., & Carlson, E. B. (2019). Literature Review: Design Thinking and Place. *Journal of Business and Technical Communication*, 33(4), 431-436. <https://doi.org/10.1177/1050651919854079>
- Pavlik, John V. (2023). Collaborating with ChatGPT: Considering the implications of generative artificial intelligence for journalism and media education. *Journalism & Mass Communication Educator*, 78, 84-93.
- Pope-Ruark, Rebecca; Tham, Jason; Moses, Joe; & Conner, Trey. (2019). Introduction to special issue: Design-thinking approaches in technical and professional communication. *Journal of Business and Technical Communication*, 33(4), 370-375. <https://doi.org/10.1177/1050651919854054>
- Pope-Ruark, R. (2019). Design thinking in technical and professional communication: Four perspectives. *Journal of Business and*

- Technical Communication*, 33(4), 437-455. <https://doi.org/10.1177/1050651919854094>
- Purdy, James P. (2014). What can design thinking offer writing studies? *College Composition and Communication*, 65(4), 612-641.
- Qadir, Junaid; Islam, Mohammad Qamar, & Al-Fuqaha, Ala (2022). Toward accountable human-centered AI: Rationale and promising directions. *Journal of Information, Communication and Ethics in Society* 20 (2), 329-342.
- Redish, Janice, & Barnum, Carol. (2011). Overlap, influence, intertwining: The interplay of UX and technical communication. *Journal of Usability Studies*, 6(3), 90-101
- Salvagno Michele; Taccone Fabio Silvio; & Gerli Alberto Giovanni (2023). Can Artificial Intelligence help scientific writing? *Crit Care*, 1 (75). doi: 10.1186/s13054-023-04380-2.
- Sambasivan, Nithya (2019). The remarkable illusions of technology for social good. *ACM Interactions* 26(3), 64-67.
- Sambasivan, Nithya, & Holbrook, Jess (2019). Towards responsible AI for the next billion users. *Interactions*, 68-71.
- Seo, Kyoungwon; Tang, Joice; Roll, Ido; Fels, Sidney; & Yoon, Dongwook, (2021) The impact of artificial intelligence on learner-instructor interaction in online learning. *International Journal of Education Technology in Higher Education* 18(54). <https://doi.org/10.1186/s41239-021-00292-9>
- Shalamova, Nadya (2019). Beyond cultural dimensions: digital inclusion in global UX. *Proceedings of the 37th ACM International Conference on the Design of Communication*, 1-5.
- Shalamova, Nadya. (2016). Blending engineering content with design thinking and UX to maximize student engagement in a technical communication class. *IEEE International Professional Communication Conference, Austin, TX, USA, 2016*, pp. 1-5, doi: 10.1109/IPCC.2016.7740493.
- Shalamova, Nadya; Rice-Bailey, Tammy; & Wikoff, Katherine. (2019). Evolving skill sets and job pathways of technical communicators. *Communication Design Quarterly*, 6(3), 14-24
- Shieh, Jessica (June 2023). Best practices for prompt engineering with OpenAI API. *Prompt Engineering*. <https://help.openai.com/en/articles/6654000-best-practices-for-prompt-engineering-with-openai-api>
- St. Amant, Kirk. (2022). Context, cognition, and the dynamics of design thinking: Cognitive methods for understanding the situational variables affecting usable design. *Technical Communication*, 69(1), 27-39.
- Stanford Center for Teaching and Learning (2023, April 21). *AI Tools in teaching and learning: Guidance on understanding how AI tools can impact teaching and learning*. <https://teachingcommons.stanford.edu/news/ai-tools-teaching-and-learning>
- Stokel-Walker, Chris (2022, December 9). AI bot ChatGPT writes smart essays — should professors worry? *Nature*. <https://www.nature.com/articles/d41586-022-04397-7>

- Tham, Jason (2022). Pasts and futures of design thinking: Implications for technical communication. *IEEE Transactions on Professional Communication*, 65 (2), 261-279.
- Tham, Jason; Howard, Theron; & Verhulsdonck, Gustav. (2022). Extending design thinking, content strategy, and artificial intelligence into technical communication and user experience design programs: Further pedagogical implications. *Journal of Technical Writing and Communication*, 52(4), 428–459. <https://doi.org/10.1177/0047281621107253>
- Tham, Jason. (2021). *Design thinking in technical communication: Solving problems through making and collaboration*. New York, NY: Routledge.
- Toscano, Joe (2023, April 20). Banning ChatGPT in schools is like banning calculators in math class. *Forbes*. <https://www.forbes.com/sites/joetoscano1/2023/04/20/banning-chatgpt-in-schools-is-like-banning-calculators-in-math-class/?sh=123281d81213>
- Turnitin. (2023). Guide for approaching AI-generated text in your classroom. Retrieved from <https://www.turnitin.com/papers/guide-for-approaching-ai-generated>
- Verhulsdonck, G., Howard, T., & Tham, J. (2021). Investigating the Impact of Design Thinking, Content Strategy, and Artificial Intelligence: A “Streams” Approach for Technical Communication and User Experience. *Journal of Technical Writing and Communication*, 51(4), 468-492. <https://doi.org/10.1177/00472816211041951>
- Verhulsdonck, Gustav, & Shalamova, Nadya. (2020). Creating content that influences people: Considering user experience and behavioral design in technical communication. *Journal of Technical Writing and Communication*, 50(4), 376–400.
- Warner, John. (2022, December 5). Freaking out about ChatGPT. *Inside Higher Ed*. <https://www.insidehighered.com/blogs/just-visiting/freaking-out-about-chatgpt%E2%80%94part-i#.Y5C1jC3AELk.link>
- Westfal, Chris (2023, January 23). Educators battle plagiarism as 89% of students admit to using OpenAI’s ChatGPT for Homework. *Forbes*, <https://www.forbes.com/sites/chriswestfall/2023/01/28/educators-battle-plagiarism-as-89-of-students-admit-to-using-open-ais-chatgpt-for-homework/?sh=759e6a9c750d>
- Wible, Scott (2020). Using design thinking to teach creative problem solving in writing courses. *College Composition & Communication*, 71(3), 399-425.
- Williamson, Ben; Macgilchrist, Felicita, & Potter, John. (2023). Re-examining AI, automation and datafication in education. *Learning, Media and Technology*, 48(1), 1-5. <https://doi.org/10.1080/17439884.2023.2167830>.
- Wood, Patrick, & Kelly, Mary Louise. (2023, January 26). Everybody is cheating: Why this teacher has adopted an open ChatGPT policy? *NPR*. <https://www.npr.org/2023/01/26/1151499213/chatgpt-ai-education-cheating-classroom-wharton-school>

Author Information

Dr. Nadya Shalamova is a professor and the director of the User Experience (UX) program at the Milwaukee School of Engineering. She teaches courses in UX, technical communication, business and engineering presentations, creative thinking, and linguistics. Nadya's research interests lie in curriculum development, engineering communication, information architecture, conversation design, and AI applications in education. Her research has appeared in *Journal of Technical Writing and Communication*, *Communication Design Quarterly*, *IEEE Transactions on Professional Communication*, and *ACM Proceedings of the ACM on Human-Computer Interaction*.

Dr. Tammy Rice-Bailey is an Associate Professor of Technical Communication (TC) and User Experience (UX) at the Milwaukee School of Engineering. Prior to her academic career, she managed corporate documentation and training for global software, financial, and retail corporations. Her work has been published in *Technical Communication Quarterly*, *Technical Communication*, *Technical Writing and Communication*, and elsewhere. Tammy is co-author of *Interpersonal Skills for Group Collaboration: Creating High-Performance Teams in the Classroom and Workplace* (Routledge).