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Using textual GenAI (ChatGPT) to extract design concepts from stories

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Abstract: In this paper, I devised and embedded textual Generative Artificial Intelligence (GenAI) into a design approach to digitally translate stories into design concepts. This approach allows design students to brainstorm ideas variedly and quickly based on a story and scope out design opportunities. Currently, design students manually conceptualise ideas from stories by reinterpreting the story, abstracting key ideas from the story, and using metaphors and allegories to extrapolate design narratives from the given story. While visual GenAI software has sparked great design and research interest in its ability to visualise ideas rapidly, textual GenAI software has received less attention in the design discipline. This design-led research presents my textual GenAI-embedded design approach for students to digitally generate design ideas from stories that are then developed into installation designs. The outcomes show that integrating textual GenAI into the design workflow affords a range of allegories from the same story for design students to translate into different design concepts. Nonetheless, design students must still realise these digital interpretations as visual designs and then into installation proposals. Based on the outcomes, design students can use the proposed textual GenAI embedded design workflow to generate different allegories and then choose one for design development.

Keywords: *Generative AI; ChatGPT; concept design; allegorical architecture*

Introduction

Ever since the public release of Generative Artificial Intelligence (GenAI) tools, such as MidJourney, Dall-E, and ChatGPT, in 2022, there has been an explosion of discussion topics on how designers can use GenAI in their design processes. Design projects that use AI have begun to appear on popular design blogs. Some of the projects include urban design (e.g. Sidewalk Labs, 2022), architecture (e.g. SPAN, 2020), product design (e.g. STARCK, 2020), engineering design (e.g. Hyperganic Group, 2021), and performance design (e.g. Choy, 2021). Design students have already started to showcase how they incorporated GenAI into their design projects at learning conferences (e.g. Tan, Milligan, et al., 2023), in state design festivals (e.g. Borg, 2023), and even at research conferences (e.g. Luhrs & Tan, 2022). This year alone, there have even been design competitions launched that ask participants only to use GenAI to create proposals for urban design (Arch-Hive, 2023), architectural design (SPACE10, 2023), and automobile design (DeAuto, 2023). Such project news and the promotion of using GenAI in design competitions signal GenAI's prospective influence in reshaping our current design workflows.

Researchers in design education have also begun to interrogate the capabilities, opportunities, and challenges of getting design students to use GenAI in their projects too. Such projects range from using GenAI to generate ideas with students through conversation (Simeone et al., 2022), to designing and testing GenAI-assisted workflows for students to expand the design opportunities (Yousif & Vermisso, 2022). While visual GenAI has sparked great research interest in their ability to visualise ideas rapidly, textual GenAI software has received less attention. This is



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understandable, as textual GenAI like ChatGPT and Simplify are text-based and do not conveniently transpose themselves into visual-based design processes.

This study responds to this gap by introducing design educators to a *design workflow* that uses ChatGPT, a textual GenAI software, to generate ideas from historical stories for students to develop into architectural designs. This study contributes to exploring how design students can use textual GenAI software in their workflow. The significance of this work lies in demonstrating how textual GenAI, as opposed to visual GenAI, is integrated into architectural design pedagogy and how it helps design students find potential design ideas based on stories. The second contribution is the testing outcomes of the design workflow in an undergraduate architectural design subject, where I discuss how textual GenAI affords design students a diversity of ideas, and the challenges students may face when attempting to integrate textual GenAI into their design workflow.

Background

To understand how design students can use textual GenAI in developing design concepts, the section below first describes the current literature on how designers use metaphors and allegories to derive concepts and recent works that use allegories to produce a design. Next, it explains how researchers use GenAI to ideate and design. Finally, this study uses *Systems Generating Systems* as a theoretical framework to justify its focus on developing and testing a design workflow in a design curriculum.

Using metaphors to derive design concepts

Metaphors and allegories are “interpretive technique[s] by which readers can assert meanings for texts which may differ from what their authors intended those texts to mean” (Berek, 1978, p. 118). How the asserted meaning relates to the writing is intentionally unclear, as figuring out the relation enables the reader to form their interpretations and associations between supposed meaning and given writing. Therefore, metaphors are about expressing linguistics and showing how they are fundamental to human thought and understanding abstract concepts (Lakoff & Johnson, 2008). An example of a metaphor is “she wears her heart on her sleeve.” Wearing one’s heart on one’s sleeve is impossible, but when readers visualise such a situation, the reader forms a meaning that she bares her heart readily and is open with her feelings. Metaphors are phrases or short pieces of writing, whereas allegories are entire stories. Aesop’s *The Tortoise and the Hare* fable exemplifies an allegory. The fable describes a race between a slow tortoise and a fast hare. The hare was overconfident of its speed and stopped midrace to rest. The hare, though slow, moves continuously and eventually wins the race. The allegory focuses on slow, steady, and continuous progress to succeed (i.e., the tortoise) instead of relying on speed and confidence.

There are many ways designers use metaphors to create new design ideas. They can apply metaphors to describe design problems or opportunities (Cila, 2013) and integrate disparate sources to reframe design briefs (Hekkert & Cila, 2015). Metaphors are also important techniques that help designers explain their design process, particularly how they created their design framing (Pee et al., 2015). As “design often demands things or connections to be named for which every day language has no terms” (Gänshirt, 2007, p. 128), designers also use metaphors to bind their novel designs with familiar names and meanings. This technique uses how metaphors illuminate their unfamiliar design through the projected experience of another (Wilden, 1987, p. 198). For example, architect Le Corbusier’s “A house is a machine to live in” metaphor combines the concept of housing and industry manufacturing to suggest that a house ought to be designed effectively and rationally. Another example is architect Buckminster Fuller’s *Dymaxion House*, a metaphoric outcome combining *dynamic* and *maximum*. Inventing metaphors provides a different way to understand the idea (see Bateson & Bateson, 1988, pp. 25–30) so that others can perceive the idea through the designer’s intended *frame*.

Using allegories to create architectural design

Allegories are also effective concept developers in architectural design, enabling architects to interrogate and communicate complex ideas and critical meanings through design. While it is common knowledge that architecture represents built designs, there is also ‘paper architecture’ (see Love, 2010). Paper architecture remains unbuilt for its purpose is not to realise a design but for designers to use architectural design processes and outcomes to engage in a discourse with design practice, societal issues, and architectural activism. Designers of such creations range from Archigram (2018), Superstudio (Architectuur, n.d.), and Lebbeus Woods (2012) of the 60s and 70s to Brown (1999) and Cantley (2008) in more recent times. In this realm of architecture lies the value of allegories as an instrument to develop design concepts. According to Haralambidou (2006, p. 118):

The allegorical architectural project is characteristically disconnected from the material construction of a building. The imaginative, sometimes poetic, bringing together of ideas in the design positions it closer to visual literature and, because of its high dependency on narrative, I see it here as a cross between a work of art, painting or sculpture, and a literary text.

Morrish (2021) allegorised the features of a truth-finding compass-like device, which played a key role in Philip Pullman's *His Dark Materials* trilogy, to stage his project's research and design workflow. Through his "truth-finding" workflow, Morrish produced an allegorical architecture that sought to reawaken the transformative heritage stories that form place identity. Andrews (2020) allegorised the duality of shown books and censored literature, which defined a library in Gürsel's *The Graveyard of Unwritten Books*, to explore the lesser recognised aspects of architecture. In his architectural proposal, Andrew curated six "architectural fixtures" as the Gürsel's library of books that never came to be, as an allegory of the censored literature. By leveraging allegories in architectural design workflows, designers can develop concepts that are rich in symbolism and meaning, which may lead to more critical and thought-provoking designs.

Using Gen AI to ideate designs

The use of AI in the early design phase has yet to be fully explored (Stoimenova & Price, 2020), and its potential impact on shaping design practices is also undetermined (Cautela et al., 2019). Nonetheless, designers and design researchers have already begun using GenAI in the early design phase to:

- ideate novel and performance-based design configurations based on shape grammar (Serra & Miralles, 2019, 2021),
- expand divergent thinking and promote convergent thinking in speculative design (Simeone et al., 2022),
- develop a visual persona brief and then inform an architectural proposal (Luhrs & Tan, 2022),
- ideate aircraft design prototypes from animal origami (Tan, Luke, et al., 2023), and
- bi-associate food and buildings to generate architectural designs (Koh, 2023).

It is important to note that while GenAI is a digital tool, it performs more closely to a person's cognition process than computer software (Stoimenova & Price, 2020). This changes the dynamics between how a designer uses this tool because, the designer is in fact, collaborating with a "non-human agent... that assumes inductive and deductive behaviour" (Figoli et al., 2022, p. 2) to produce a design outcome that is of a "mixed-initiative... human-machine co-creativity" (Yannakakis et al., 2014, p. 8). Therefore, this research explores how GenAI, as a collaborative agent, allegorises stories and provides designers with ideas in the concept design phase.

Theoretical framework

To understand how design students can integrate GenAI into their concept development, this study adopts Alexander's (1968, p. 605) *Systems Generating Systems*, which posits:

There are two ideas hidden in the word system: the idea of a *system as a whole* and the idea of a *generating system*.... A generating system... is a kit of parts, with rules about the way these parts may be combined.

Designing is a complex series of multiple interconnected tasks. These tasks make up Alexander's (1968) *kit of parts*, which when combined into a workflow, results in a system that generates a design. This workflow-oriented process references Simon's (1969) scientific approach to delivering a design, whereby the process is constrained by the environment and resources available. In the case of digital design workflows, computational ability forms one of such constraints. Additionally, by focusing on developing workflows, designers can examine their creative design process and identify tasks where digital tools can be swapped in to enhance their creativity (see e.g. Yousif & Vermisso, 2022). Design researchers can consider such workflows as "experiments" (Binder & Redström, 2006), as workflows act as exploratory probes that make the design research more open for others to test its relevance to design. As there are many opportunities in design to integrate GenAI into its workflow, this study focuses on generating concepts, often at the start of a design project.

According to Yang et al. (2018), there are two approaches to teaching students how to design with data and AI. The first approach is to give students a technical understanding of how such technologies work. Hence, they know the capabilities and process before applying it to their design projects. The second approach is to allow students to explore the technology and learn-by-doing to become familiar with the capabilities. The second approach is based on Schön's (1983), *Reflective practice* theory, where students gain hands-on experience through *reflecting-in-action* and *reflection-on-action* with the technology through their experimentations. Using the proposed workflow, this study

adopts the second approach to educate design students on brainstorming design ideas from stories using textual GenAI.

Research Design

I conducted design-led research to explore and experiment with integrating textual GenAI in a design workflow for students to transpose literature into design concepts. This research is relevant to design education because it pioneers the integration of textual Generative AI (GenAI) to augment students' design workflows and nurture their creative and ideation capabilities. The design leading this design-led research is the workflow (see section *Research instrument* below), not the design outcomes produced in the experiments. Developing and calibrating digital design workflows can strengthen designers' intuition of the potential of novelty in their design outcomes (Yousif & Vermisso, 2022). Thus, I focused on the workflow and then examined its advantages and limitations through the design outcomes because this project aims to find out how textual GenAI can assist a designer's ideation process in early design.

Research instrument (design workflow)

I integrated ChatGPT-3, a textual GenAI chatbot (OpenAI, 2022a), into a design workflow to automatically create allegories. These digitally-generated allegories allow designers to translate a story (i.e., workflow input) into a design concept. This is unique as allegorising literature into design concepts is still a manual method; designers need to reinterpret a story cognitively and derive an allegory. I visualise the current and proposed workflow in Figure 1.

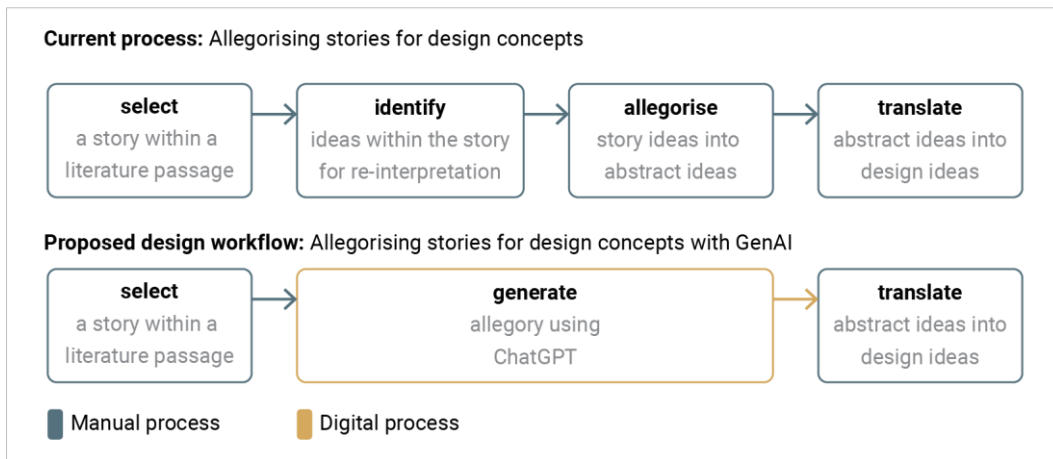


Figure 1 Proposed design workflow assisted by textual GenAI, ChatGPT

I tested this design workflow before implementing it in a design curriculum. I first prompted ChatGPT-3 to provide a story of Aphrodite, a well-known character in Greek mythology (see Figure 2). Then, I prompted ChatGPT-3 to describe the allegories of Aphrodite's story. This two-step action first aims to enable ChatGPT-3 to generate a story about Aphrodite and subsequently rely on the story it generates to create allegories (see Figure 3).

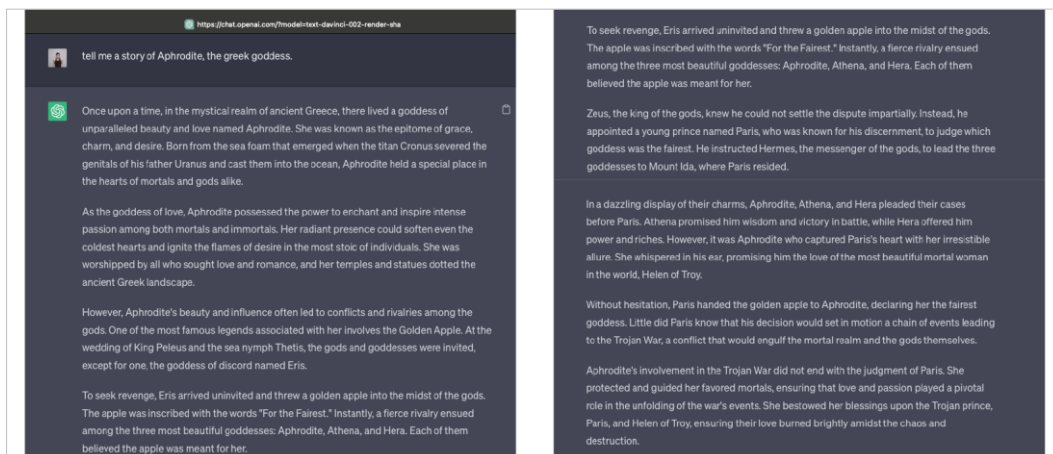


Figure 2 Testing the design workflow to produce a story

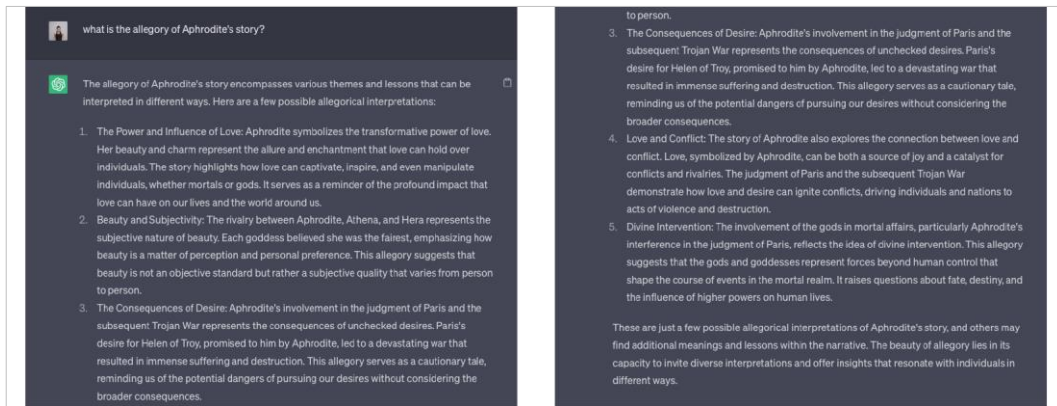


Figure 3 Testing the design workflow to produce an allegory from the generated story

It is important to point out here that “ChatGPT sometimes writes plausible-sounding but incorrect or nonsensical answers” (OpenAI, 2022b), and still requires the designer to fact-check its responses. While I will expand on this limitation in the *Discussion* section below, this potentially “nonsensical” output performs as an allegory to provide designers the impetus to reframe stories into design concepts.

Research context (Implementation)

I experimented with the design workflow in a third-year undergraduate architectural design setting in March 2023 with 93 students. The students’ first task was to create a concept based on a story. This task involved students picking a Greek mythological character and its story, then using the proposed design workflow (refer to Figure 1) to generate an allegory from the myth. Students were allowed to choose any character, its story, and the generated allegory; there was no intervention from the teaching team at this stage. The subsequent tasks were to design and develop an architectural installation based on the generated allegory.

Experiment outcomes

Out of the 93 experiments, five were about *Prometheus*. I describe three of the five experiments in detail below, as they demonstrated maximum variation of allegories, leading to vastly different installation proposals, 1) a pillar-based installation, 2) a lighting installation, and 3) a wall installation.

Design experiment 1: *Prometheus’s struggle*

In design experiment 1, ChatGPT-3 created the following allegory:

The story of Prometheus is often interpreted as a metaphor for humanity's *struggle* to overcome ignorance and *darkness* and to gain knowledge and enlightenment. It also illustrates the idea that progress often comes at a cost, and that those who seek to change the world may face *opposition and persecution* from those who wish to maintain the status quo.

From this allegory, *struggle*, *darkness*, and *opposition and persecution* were ideas developed in the design process and translated into visible elements of the final installation proposal. In the design process, *struggle* was explored in a working prototype where the designer had to move rods, connected by gears, to control a wooden ball (see Figure 4, Poster 1). When it came time to scale up the mechanical prototype into an installation proposal (see Figure 4, Poster 2), the idea of *opposition and persecution* replaced the *struggle* and was depicted by a hand moving the pillars above the surface, translating into an opposite motion below the surface.

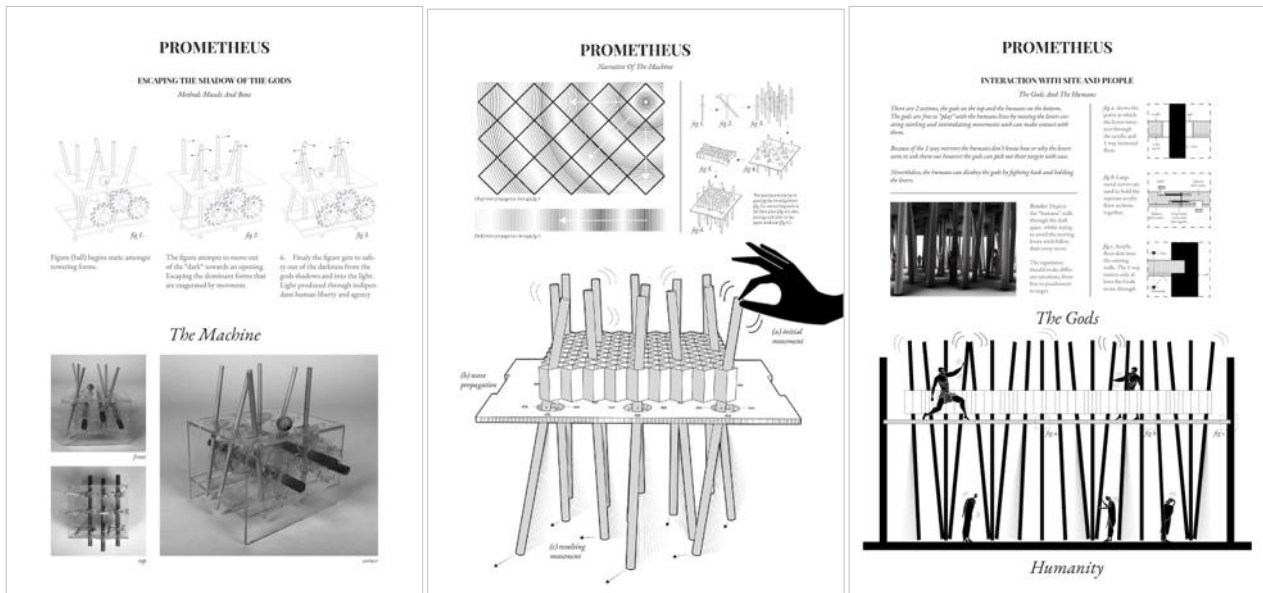


Figure 4 Carter’s (2023) design posters of Prometheus’s allegory into an installation proposal

As explained in Poster 3, the final design linked to ChatGPT-3’s generated allegory is as follows:

There are 2 sections, the gods on the top and the humans on the bottom. The gods are free to "play" with the humans lives by moving the levers creating swirling and intimidating movements which can make contact with them. Because of the 1-way mirrors [that is the surface] the humans don't know how or why the levers seem to seek them out however the gods can pick out their targets with ease. Nevertheless, the humans can disobey the gods by fighting back and holding the levers.

In the final design (see Figure 4, Poster 3), the idea of *struggle* was retained and exemplified by “trapping” the individuals within the installation, where the humans were shown stuck between the moving pillars. The idea of *darkness* was maintained as a spatial quality within the installation, as Carter designed the space to be unlit. Finally, the idea of *opposition and persecution* was illustrated as the gods moving the pillars from above and manipulating the dark space where the humans are trapped below.

Design experiment 2: Prometheus’s enlightenment

In design experiment 2, ChatGPT-3 created the following allegory:

“The Symbol of Enlightenment: Some interpretations of the myth see Prometheus as a symbol of *enlightenment* and intellectual progress. In this view, the *gift of fire* represents the ability to reason and think for oneself, and Prometheus is admired for his role in bringing this gift to humanity.”

From this allegory, *enlightenment*, *gift*, and *fire* were ideas used in the design process and became the visible concept of the final installation proposal. In the design process, *enlightenment* and *fire* were explored through the opening and closing of the folding paper prototype (see Figure 5 Poster 1). This is depicted in yellow, revealed when the paper model is stretched and opened. The closed-to-opened configuration of the paper model also conceptualised the motion of *gifting*, as though *bringing* light to the designer.

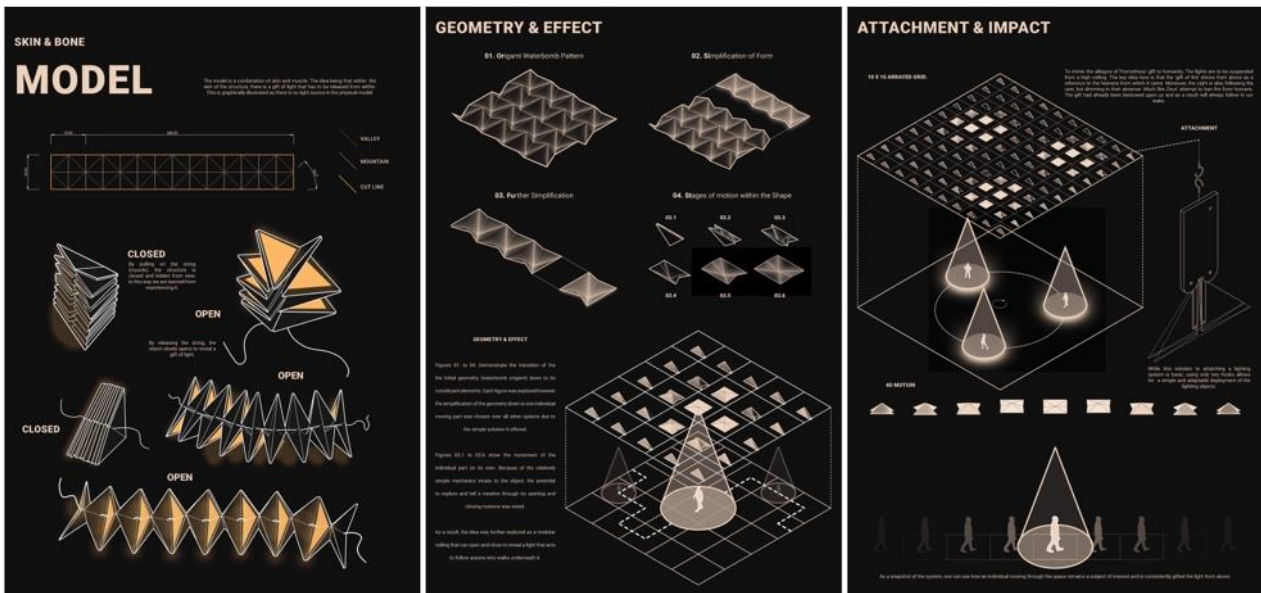


Figure 5 Blackmore's (2023) design posters of *Prometheus's* allegory into an architectural installation proposal

As explained in Poster 3, the final design linked to ChatGPT-3's generated allegory is as follows:

To mimic the allegory of Prometheus' gift to humanity, the lights are to be suspended from a high ceiling. The key idea here is that the 'gift of fire' shines from above as a reference to the heavens from which it came. Moreover, the Light is also following the user, but dimming in their absence. Much like Zeus's attempt to ban fire from humans. The gift had already been bestowed upon us and as a result will always follow in our wake.

Interestingly, *enlightenment* became a more prominent feature in the final design (see Figure 5 Poster 2). The design prototype demonstrated *enlightenment* by bringing light, and positioning the light to shine onto the top of the users' heads, which is connected more conceptually to enlightening a person. Additionally, the design is activated only when a person appears directly below the light and in areas where no one is around, the light is deactivated (see Figure 5 Poster 3). This also conceptualised *gifting*, that the *fire* can only be given when a receiver (i.e., the human) is in its presence.

Design experiment 3: *Prometheus's eagle*

In design experiment 3, ChatGPT-3 created the following "allegory":

Greek mythology is not best known for its teachings of morality or allegories, and so there are many ways in which these tales can be interpreted. For example, the tale of Prometheus could be knowing the worth of free will and intelligence, and persevering to achieve that against all odds. Perhaps the story simply stands as a gory metaphor for human evolution against all forces. As the story allegedly ends after he is finally set free, there seems to be no consequence for his suffering, or his good deeds for humanity.

Oddly, ChatGPT-3 pointed out the lack of allegories. As such, this experiment relied on a character in Prometheus's myth, the *eagle*, as a design concept (see Figure 6).

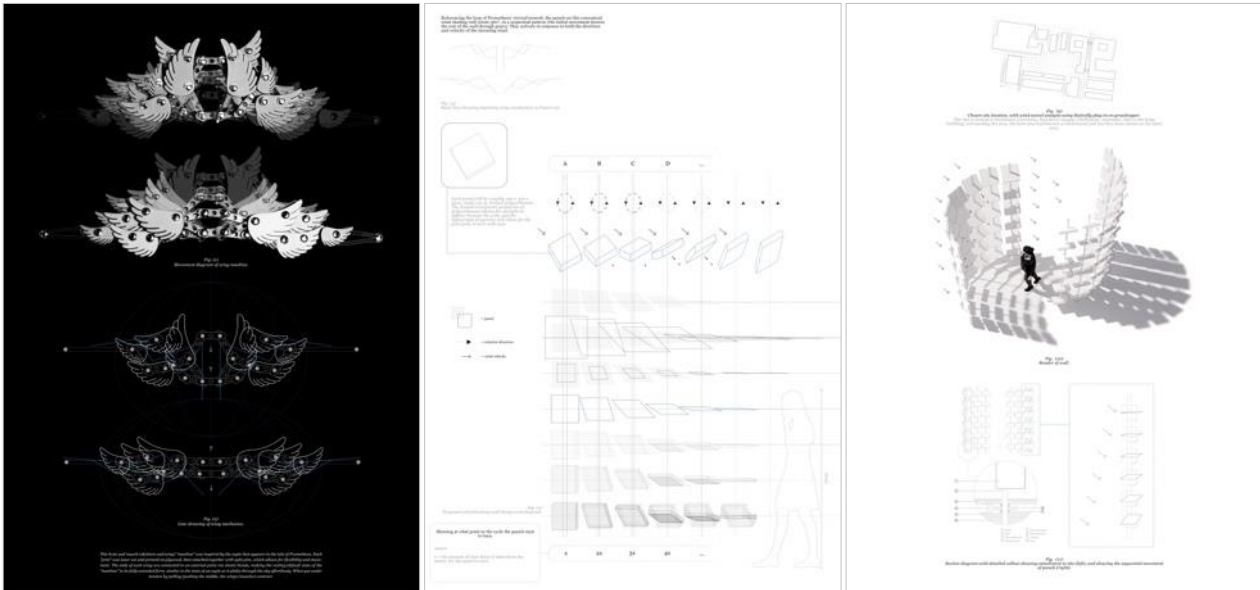


Figure 6 Tsiang's (2023) design posters of Prometheus's "allegory" into an installation proposal

In the design process, the eagle's wing was translated into a physical element of the design prototype (see Figure 6, Poster 1). The open configuration of the prototype referenced the eagle's widespread wings gliding through the air whereas the closed configuration references the eagle's wings retracted into its body. This wing movement was further developed as a key feature of the design (see Figure 6, Poster 2), which resulted in a wall installation (see Figure 6, Poster 3) where the panels are moved by the wind, like the feathers of an eagle propelling the bird through the air. ChatGPT-3 did not provide an allegory, so this experiment resulted from the traditional method of manually coming up with a concept.

Discussion: The light, the dark, and the literal

This study used textual GenAI, ChatGPT-3, as an allegory generator within a design workflow. I then examined GenAI's impact on design concepts. Below, I contextualise this study with prior research, identify its limitations, propose research opportunities that further integrate GenAI technology into design workflow, and discuss the pedagogical implications for educators and students during the concept development phase.

In Experiment 1 and 2, ChatGPT-3 allegorised the intangible characteristics of Prometheus's story. This afforded the designers to be more abstract when translating the story into design concepts. The pillar-based installation proposal of Experiment 1 replicated the user's struggle within the installation, whereas the light installation of Experiment 2 replicated the sense of enlightening the user from above. In Experiment 3, where ChatGPT-3 did not provide a clear allegory, the wall installation literally translated a tangible and visible component of Prometheus's story, the eagle's wing.

In Experiment 1, ChatGPT-3 focused on the struggle and darkness in Prometheus's story, whereas in Experiment 2, ChatGPT-3 identified the opposite, the gift and enlightenment. In each of the experiments, ChatGPT-3 only provided one theme. This dismissed the opportunity for designers to explore richer concepts that draw on both themes. This can be compared with Andrews's (2020) allegorisation of the dual themes as two opposing forces that reinforced one another, which enabled him to deliver a design concept that blended the scale of fixtures and buildings. Where Andrews was able to explore richer concepts that exist between two themes, the absoluteness of ChatGPT-3's response in each experiment led designers to build upon a singular theme.

In Experiment 3, where the allegorisation was done manually, a tangible characteristic of Prometheus's story (i.e. eagle wing) was translated directly into a design feature. When Morrish (2021) allegorised a tangible characteristic of *His Dark Materials* trilogy (i.e., a truth-finding compass-like device), he used it as a conceptual device to guide this research and design process. In other words, he translated a tangible feature into an intangible device in his project. Since ChatGPT-3 did not provide a clear allegory, any comparison between Experiment 3 and Morrish's work is inconclusive. However, a case might be put forward that the 'lack of allegory' from ChatGPT-3 might have reinforced that there is no hidden meaning or deeper concepts to be explored in the story and thus, a literal translation of the tangible characteristic was necessary to extract design ideas from the story.

The novelty of this study, which is the use of textual GenAI for generating allegories to produce architectural design, poses a comparative challenge to prior research, as most of these works relied on visual GenAI, except for Simeone et al. (2022). In their research, design students probed textual GenAI software with questions (see their *Project Alpha* experiment), which its responses “opened up possibilities and directions [for students] to follow” (2022, p. 10). In my study, ChatGPT-3 not only introduced concept possibilities from a story, but its allegorical explanation also suggested one direction for designers to follow. This is evident in Experiments 1 and 2, where both design concepts ended up thematically opposite of one another (*struggle and darkness vs gifting and enlightenment*).

Limitation

The key limitation of this study is that while ChatGPT is “trained to recognize patterns in vast swaths of text harvested from the internet” (Shankland, 2023), it is still incapable of understanding the complexity of the English language (Bogost, 2022). This limitation results in ChatGPT potentially producing plausible-sounding but incorrect answers. If the allegories are well known and recorded on the internet, such as Aesop’s *The Tortoise and the Hare* fable, ChatGPT will likely give an accurate interpretation of the story. Otherwise, it may provide an inaccurate response and obstruct designers from developing concepts.

Recommendation

Despite this limitation, the outcomes are nonetheless beneficial to further the discussion of how designers can use textual GenAI to augment concept development. Researchers can expand the GenAI component of the proposed design workflow by developing more human-AI interaction tasks within the component. In this study, the designer prompted GenAI to generate an allegory from a given story. This workflow can be expanded to instruct designers on how to evaluate, respond, correct, and re-prompt the GenAI responses, so that designers can engage with concept development more critically before developing a design.

Implications

I recommend design educators and students looking to use textual GenAI in their design workflow with caution. Textual GenAI like ChatGPT responds quickly and can provide a range of ideas for design students to pick and develop as a concept. However, its plausible-sounding responses may deter students from probing more critically with the idea. Additionally, textual GenAI’s possibly inaccurate response may mislead students to a dead end in their concept generation process.

Conclusion

Generative AI can potentially influence how we practise design, and the cases in this paper show how textual GenAI can help design students come up with different concepts from a single idea. While most research focuses on the value of visual GenAI in design processes, I demonstrated how textual GenAI can help designers develop design concepts. As there are scant studies that show how textual GenAI can be used in design workflows, this paper guides design students and design educators on how ChatGPT can be used to generate allegories, which enables design students to derive different design concepts quickly from a given piece of literature. This design-led research first demonstrated where textual GenAI can be used within the concept development workflow, then tested the digital workflow in an undergraduate architectural design curriculum. The experiment outcomes showed how a variation of generated allegories from the same story led to different design proposals and demonstrated the potential use of textual GenAI in concept design development.

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