Prompting Design: Evaluating the Impact of AI on Design Outcomes

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Abstract: This paper assesses how the integration of generative AI (GenAI) image tools impact landscape design processes and outcomes compared to traditional design methods with the goal of providing insight into GenAI's role as a design tool, its strengths and limitations, and its effectiveness in early-stage landscape architecture workflows. It describes a within-subjects crossover study of undergraduate landscape architecture students where they completed equivalent design tasks in two treatment groups utilizing either traditional design methods or GenAI-integrated design methods, self-reported their experience, and then assessed the quality of their designs using third party experts. The findings suggest that GenAI can help designers develop novel design concepts, and that it does not significantly alter quality of design outcomes when the designer is significantly in-the-loop with the GenAI workflow. Participants also generally reported positively on the impact of GenAI use on creative process. However, highest rates of GenAI use were correlated with lower evaluations, suggesting outcomes are improved by design maturity and GenAI use rather than GenAI as a blunt tool. The work contributes to a growing discussion on how AI can be integrated into design education and professional practice and helps elucidate previous findings on GenAI's value as both a creative and technical tool.

Keywords: Artificial intelligence, generative AI, design process, aesthetics

1 Introduction and Literature Review

Artificial intelligence (AI) is a broad term used to describe computer-based systems designed to perform complex tasks that normally would require human intelligence. AI systems are now widely used across various industries, including the architecture, engineering, and construction (AEC) professions (CHAILLOU 2021), where they assist with tasks such as data analysis, decision-making, and problem-solving. AI applications in landscape architecture are wide ranging, whether for predictive analytics, ecological modeling, landscape policy evaluation, or conceptual design generation, among other things (FERNBERG & CHAMBERLAIN 2023). Recently, image creation using generative AI (GenAI) models has become increasingly integrated into design workflows, automating certain tasks and providing new ways to generate and evaluate design concepts (REKKITKE & HAYLES 2025).

In landscape architecture, designers rely on logical and creative decision-making, balancing site constraints, programmatic needs, and aesthetic principles to create a harmonious design (NIJHUIS & VRIES 2019). While GenAI has shown potential as a design tool, it remains limited in its ability to fully replicate the complexity of human-led design, especially in its inability to contextualize design within the site (PLOENNIGS & BERGER 2023). Moreover, few design studies focus on AI's impact on design outcomes and AI's influence on designers' workflows, efficiency, and design decisions (AS et al. 2018, CHEN et al. 2023).

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2 Methods

This study employed a within-subjects crossover design to evaluate the impact of integrating GenAI into early-process workflows on design processes and outcomes. Participants (n=35, 18 male, 17 female) in the study were 3rd year undergraduate landscape architecture students who were assigned to one of two treatment groups utilizing either traditional design methods or GenAI-integrated design methods. In the traditional process students explored and developed design forms by hand and were allowed to use industry-standard digital tools (e. g. Adobe Creative Suite, CAD, etc.) to explore and refine a design schematic. This process mirrored traditional design processes used in the contemporary practice and instruction of landscape architecture. In the GenAI-integrated design process, students utilized the same traditional design approach, but their efforts were supplemented through using the GenAI program Midjourney to develop AI-generated images to inform their design concepts, primarily at the beginning of the design process when forms and element placement is most malleable. Each participant had creative control over how to incorporate GenAI into their process, whether abstracting, manipulating, or directly integrating the image outputs into their final work (Fig. 1). Participants were encouraged to utilize the generated imagery as inspiration to inform their design decisions, and not as a replacement for final outcomes – in other words, a "human-in-the-loop" process where human involvement in design decisions and production remains the main driver of the design outputs.

The participants completed a residential design project before switching between treatment groups to complete a second residential design project. The second project utilized the same lot and home size, with similar location on the lot, however the configuration of the interior and exterior of the house was altered to deter students duplicating design across rounds. The completed student designs (n=70) were evaluated by licensed landscape architects (n=3) utilizing a rubric composed of proven metrics for evaluating creative works from prior studies evaluating design outputs (HAN et al. 2021, CASAKIN & KREITLER 2006, DEMIRKAN & AFACAN 2012). The evaluators used a 5-point Likert scale in the rubric for each metric. The evaluators received both verbal and written instruction regarding each metric in the rubric prior to starting their evaluation (see Table 1 for a short description of each metric). To measure inter-rater reliability, the interclass correlation coefficient was calculated with good results, ICC (2,3) = .81, 95% CI [.72-.89], F (69, 138) = 6.88, p <.01). The data from the evaluations was analyzed using a paired samples, one-way T-test to compare individual performance across both conditions. We hypothesized that projects designed using GenAI would exhibit higher scores on originality and aesthetic qualities, but lower scores on functional qualities. Participants answered questionnaires utilizing a 5-point Likert-scale to gather insights about their experience using AI in their design process. The mean and SD were calculated and correlation analysis performed with the evaluator scores on the design metrics.

3 Results

The aesthetic components of the evaluation rubric included originality, rhythm, harmony, balance, and variety, as well as an overall design quality. The results indicate a statistically significant difference in originality scores, with a value of p = .044 (one-tailed), d = 0.29, 95% CI [−0.35, 0.03], suggesting that GenAI integration resulted in more original design

outcomes, though the effect size was small. The results show no statistical significance between conditions on the other aesthetic variables, nor in the overall design quality metric (see Table 1). There was no statistically significant relationship between GenAI use and functionality. The evaluators were also asked to identify which designs were produced using GenAI, in which they correctly identified GenAI projects only 49% of the time.

Table 1: Summary of the evaluators assessments of the submitted design projects with rubric descriptions. * = statistically significant <.05 threshold

	Traditional Mean	GenAI Mean	t-stat	df	Sig.
Originality: extent the design demonstrates innovative and creative solutions	2.51	2.67	1.72	34	.044*
Functionality: effectiveness of the design in addressing the stated requirements and constraints.	2.87	2.82	-0.40	34	0.34
Rhythm: repetition of elements to create direction and visual movement	2.50	2.67	1.53	34	0.06
Harmony: unity of forms and material in a cohesive whole	2.62	2.65	0.27	34	0.39
Balance: distribution of visual weight to create a sense of equilibrium	2.55	2.58	0.26	34	0.39
Variety: diverse use of materials and forms to provide interest and complexity	2.58	2.55	-0.29	34	0.38
Overall Quality: Wholistic assessment of the quality of the design.	2.52	2.63	0.99	34	0.16

Table 2: Results of the survey given to students about their perceptions using AI

Question	Average	SD
To what extent did AI image generation contribute to the variety of ideas in your design process?	3.34	0.54
Compared to traditional design methods, how would you rate the efficiency of your design process when utilizing AI image generation?	3.09	0.89
How would you describe the integration of AI image generation into your design workflow?	3.31	1.18
How do you assess the overall impact of using AI image generation software on the quality of your design outcomes?	3.4	0.65
How valuable was AI image generation software in inspiring your design concepts?	3.2	0.83
To what extent did AI image generation help you explore new design ideas?	3.45	0.82
Would you consider using AI image generation software again in future design projects?	3.6	1.03

All the participants completed the questionnaire about their experience using GenAI in their process (see Table 2). Students generally responded positively about their use, with the largest variation in responses related to how difficult it was to integrate GenAI into their design workflow and if they would consider using it again. The results were correlated with the evaluator scores to measure if the perception of the impact of AI on the process corresponded with the assessed results from the evaluators. The only significant correlations with substantial strength related to AI helping the designer explore new ideas, which had negative correlations with the metrics of function (-.42) and balance (-.46). An analysis of the results with demographic data of age, gender, and ethnicity was conducted, however there were no statistically significant correlation between these variables and evaluation scores.

4 Discussion

The results demonstrated that the GenAI-integrated method positively influenced the originality of the design outcomes in this study. This supports previous research suggesting GenAI's ability to facilitate the exploration of novel design ideas (SENEM et al. 2023, PLOENNIGS & BERGER 2023, CHEN et al. 2023, JARUGA-ROZDOLSKA 2022), and suggests that GenAI can be an effective tool to stimulate creativity and help designers generate unique forms and designs that may not have emerged through traditional approaches. This does not imply that utilizing GenAI will result in radical design solutions, but rather that it can play the role of an outside source of inspiration to help shape the overall design discourse. Using it in such a way implies that it can be particularly impactful when integrated as a design development tool early in the process.

There was no statistically significant difference between the GenAI-integrated and traditional processes in evaluating the other aesthetic components or the overall design quality. This demonstrates that GenAI has the potential to act as a complementary tool to enhance creative thinking without substantially impacting design quality or producing sterile results. It appears that the designer's role in the process remains important to the final outcomes, and that human design skills, including decision making, are still critical factors in design quality and composition, regardless of the use of GenAI. Despite rapid advancements in artificial intelligence, this implies that the traditional design approaches will remain important and may not be wholly replaced by the assistance of GenAI, rather the GenAI-integrated process may only be as successful as the designer utilizing it.

While we hypothesized that the GenAI-integrated process would result in lower functionality within the design, this was not the case, indicating that GenAI use alone does not inherently lead to impractical solutions. This was a concern raised in prior research regarding GenAI's lack of real-world contextual awareness, which may result in visually compelling but impractical designs (CHEN et al. 2023, JARUGA-ROZDOLSKA 2022). As noted with the aesthetic outcomes, having GenAI and the designer simultaneously in-the-loop appears to negate the potential negative impact GenAI-influenced designs might have on functionality. Therefore, while GenAI might enhance originality in design, other evidence clearly demonstrates that responsibility remains in the hands of the designer to ensure aesthetic and functional success.

Student opinions on the ease of integrating GenAI into their workflow produced the largest variation in responses. This may reflect a broader uncertainty about the proper integration of GenAI in design, but may also highlight that immature designers have not yet developed the

capacity for robust internal dialogue with their design (and by extension GenAI), and that they may find it difficult to utilize the generated images and ideas because they struggle to integrate those visual references with their design approach. Donald Schön (1987) theorized that design is a reflective process akin to a conversation. In this case, GenAI, using interaction driven by natural language processes, should be ideally suited for integration within discourse between the designer and their design, but it requires the designer to have the capacity to engage at a level of reflection and introspection with their design and process to leverage the natural interactions that AI applications can provide. The suggestion that such immaturity was experienced by some students in their interaction with GenAI might also be inferred by the correlations of higher reported levels of GenAI helping explore new ideas resulting in lower scores from evaluators on both function and balance. It is possible that students became enamored or aesthetically hoodwinked by the GenAI's outputs and failed to engage in a rigorous process of reflection on their GenAI-influenced design, resulting in less ideal design outcomes. Students who used GenAI in a more reflective and nuanced way were more likely to report lower levels of influence as they remained more "in control" of the process.

The findings invite a broader discussion on GenAI's impact in academia and practice. Using GenAI as an "ideation partner" may allow designers to explore a broader scope of form and materiality before transitioning to the more technical and site-specific phases of design, illustrating how GenAI might shift the emphasis of early-stage design from the manual production of imagery and ideas to the curation and refinement of conceptual possibilities. However, this research underscores that GenAI is most effective when used as a supplemental tool for ideation and is not a substitute for the designer's critical judgment. This suggests the human remains the primary driver maintaining functional and creative oversight of the process. It is likely that it will be some time before a widely accepted workflow with AI emerges and, whatever that workflow may be, it will most likely exist along a spectrum of use and integration between the designer and AI.

For academia these findings signal a necessary pivot toward GenAI literacy within the design studio, but do not call for a wholesale rethink of our design processes or instruction. Rather than viewing Gen AI as a threat to traditional skills, curricula should focus on teaching students how to effectively manage the "human-in-the-loop" process. This involves developing a pedagogical framework where students are evaluated not just on the final output, but on their ability to critically select, modify, and justify GenAI-generated concepts based on site constraints and programmatic goals.

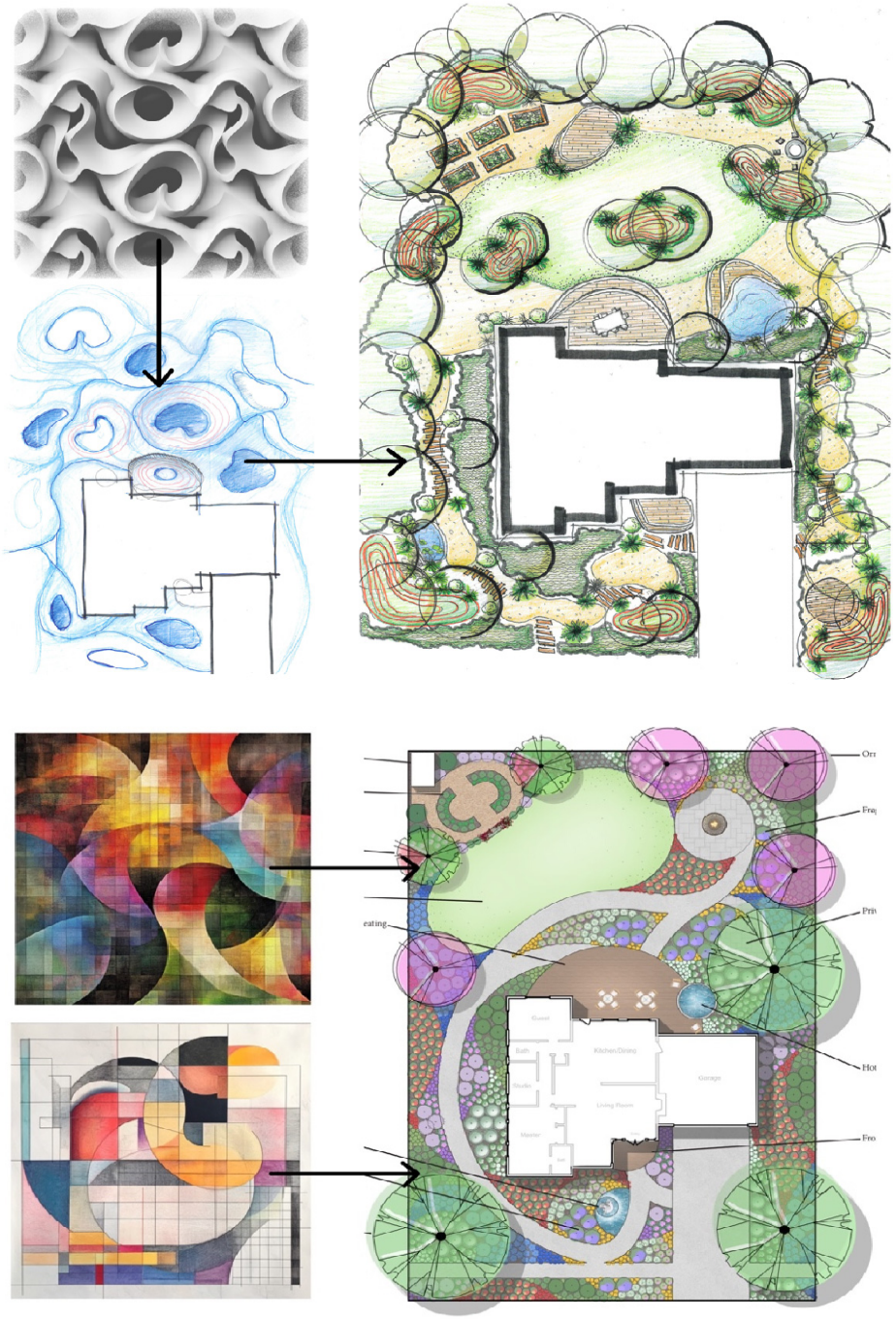

Fig. 1: Examples of final student designs with the AI prompts and design processes associated with them

There is a clear need to balance the teaching of foundational skills alongside the strategic use of prompting and iterative refinement, ensuring that students do not become overly reliant on automated outputs at the expense of developing their own design maturity and thus their ability to evaluate GenAI outputs.

Finally, the use of platforms like Midjourney in a design context is not without ethical and pedagogical risk. Ethically, the black-box nature of these models raises valid concerns regarding intellectual property and the potential for reinforcing cultural or aesthetic biases in the built environment. These appear to be manageable with careful prompting and knowledge of more advanced generative processes (such as seeds and styles), but this requires a level of awareness and management that many designers, and especially students, may not be willing to commit to. Pedagogically, there is a risk that the ease of generating high-fidelity imagery may tempt students to bypass the rigorous iterative problem-solving phase of design, leading to "hallucinated" landscapes that are visually seductive but aesthetically poor or functionally, ecologically, and structurally unfeasible. Educators must therefore emphasize that while GenAI can simulate the appearance of a completed project, it lacks the underlying spatial and biological intelligence of a trained landscape architect, necessitating a critical approach to outputs. Therefore, analytical and soft skills are likely to become even more valuable to a landscape architect in the future.

5 Limitations

A primary limitation of this study was the use of students from a single university class as study participants. This resulted in a fairly homogenous sample group in regard to design experience and educational background. Repeating this study with a more heterogenous sample may reveal demographic differences between how different groups might use and integrate GenAI. Another limitation was the lack of access to each student's Midjourney account so it was not possible to track the prompts used, the number of prompts generated, or the amount of time students spent within Midjourney. Collecting this data would have provided valuable insights into how students worked in a human-AI collaborative design process and is recommended for a future version of this study.

6 Conclusion and Future Work

In conclusion, the findings of this study suggest that GenAI-integrated design processes have the potential to enhance creativity in the landscape architecture design process in early-stage creative exploration. However, GenAI integration did not significantly impact the functionality, aesthetic composition, or overall design quality of the student work. These results align with previous research, reinforcing the idea that GenAI image generators, such as Midjourney, work best as a tool that supports designers in the iterative process of form exploration, rather than serving as a standalone design solution.

Student opinions toward GenAI use in the landscape design process were generally positive, with many indicating that GenAI image generation aided their creative exploration and that they would consider using it in future design projects. However, the correlation analysis revealed a disconnect between student perceptions and expert evaluations, suggesting that students may have overestimated or been misguided by GenAI in their design decisions. This

emphasizes the need for further research and education on how GenAI-generated imagery is critically assessed and integrated into design workflows.

Ultimately, this study highlights the advantages and limitations of AI in the design process. While GenAI tools like Midjourney can provide form inspirations and offer the rapid visualization of design concepts, they cannot replace the role of the designer in making informed, contextually grounded, appropriate decisions. Future research should explore ways to refine the integration of GenAI in the design process, specifically how these tools can better support both creative ideation and functional site planning.

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